THE

AMERICAN NATURALIST.

Vol. IV.—MAY, 1870.—No. 3.

THE INDIANS OF CALIFORNIA.*

BY EDWARD E. CHEVER.

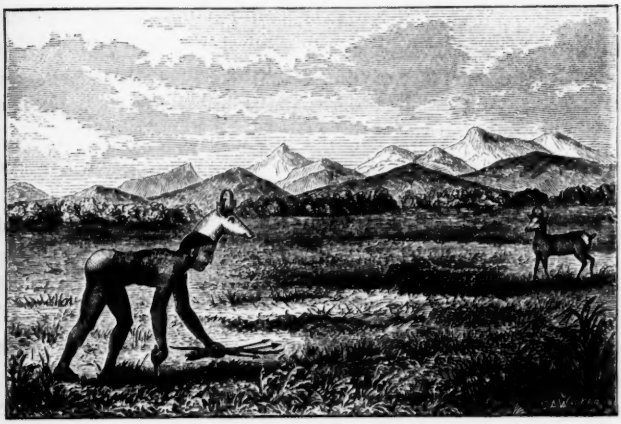

Fig. 34. Indian stalking an Antelope.

THE name "Digger," which Frémont gave to the Indians that he found on the eastern slope of the Sierra Nevada, a

* Read before the Essex Institute, February 21, 1870. An abstract will be found in the "Bulletin of the Essex Institute" and a vocabulary of such familiar words as Mr. Chever was able to recall. It is but justice to our author to state that his familiarity with the language of the tribes, during five years of friendly personal intercourse, has given him a rare opportunity of forming a correct judgment of what these Indians really were before they were demoralized by contact with the whites, and that he has confined himself to such statements as he remembered clearly and knew to be correct. —EDS.

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people who obtained a precarious subsistance in winter by digging through the snow for roots, and searching the rocks for lizards, and who had neither villages or numerical force, has been applied by the readers of Fremont's work to all the Indians of California.*

The name was really applicable to those whom he first met with, but not to the Indians living on the other side of the mountains, who spoke a different language and were more provident than those living on the great plains east of the Rocky Mountains. The latter have been much more destructive to the whites in battle, having procured, at an early date, firearms from Indian traders. The gold excitement, however, settled California so rapidly that the Indians were in a hopeless minority after the first immigration crossed the continent, and excepting where their villages were attacked they had no wish to fight, for they had no surplus population to lose.

That these same Indians were not wanting in courage or spirit I have had repeated proofs.

They would attack the sturgeon when under water and drag him to the shore with their limbs bleeding from the sharp spikes. I have also seen Indians bearing the scars of conflicts with grizzly bears, and the frequent instances of white men scarred with wounds made by their arrows, shows that they contended courageously with the early settlers.

The Indians of California, in 1849, were the more interesting to the ethnologist from the manner in which that country had been settled. The Jesuits, it is true, had been in Lower California for many years, and had established mission schools there, and a few Europeans had a short time before made scattered settlements in the Sacramento Valley, but the whole country was so remote from our frontiers, and inclosed by the intervening barriers of the Rocky Mountains

* The Indian tribes of the section I am describing, called themselves respectively, Sesum, Hocktem, Yubum, Hololipi, Willem, Tankum, and inhabited the valley of northern California, between the Sierra Nevada and the Coast Range.

and the snows of the Sierra Nevada Range, that it had been but little changed since its discovery by the whites. Many Indian tribes were living in as perfect a state of nature as the elk, deer or antelope, which furnished them with food. A head-dress of feathers with a scanty coat of paint on his face was the full dress of a brave, while a fringe made of grass, or fine strips of bark, from the waist to the knee, was the costume of the girls or women. The Indians had but little beard naturally, and excepting in a few cases where old men had grown careless of appearances the hairs were pulled out; sometimes a pair of muscle shells were used as tweezers, although I have seen a squaw dip her fingers in ashes and pull out her husband's beard, and draw tears at the same time from his eyes. Both sexes wore ornaments in the ears, but not rings. The children had their ears bored when quite young and small sticks inserted; these were exchanged from time to time for larger sticks, until a bone ornament, made from one of the larger bones of a pelican's wing carved in rude style, and decorated at the end with crimson feathers, could be worn permanently. This bone was about five or six inches long and larger in size than my little finger. The back hair of the men was fastened up in a net, and this was made fast by a pin of hard wood pushed through both hair and net, the large end of the pin being ornamented with crimson feathers, obtained from the head of a species of woodpecker, and sometimes also with the tail feathers of an eagle. The women used no nets for their hair, nor wore feathers as ornaments, excepting in the end of the bones used by both sexes for the ears, which I have already described. The children were naturally frank and the girls gentle and confiding, not much more so, perhaps, than young grizzlies, but then I doubt whether the cub's mother threatens to give it to a white man, if it proves disobedient, and a white *man* was the *Bugbear* used to frighten papooses into good behavior. They were allowed much freedom, however, in seeking amusement or instruc-

tion; the girls acting as nurses to the younger children, and taking them off in the woods or to the river where they bathed, and the babies allowed to crawl in the water before they could walk on land. An Indian could no more remember when he learned to swim than when he first stood on his feet. When the children were disposed to be good natured the girls petted them as kindly as our children tend dolls, but if they were cross, in spite of their caresses, they threw cold water in their faces until their tempers cooled. The girls fully equalled the boys in swimming or diving, and also used the paddle with skill, sometimes even beating the boys in their canoe or foot races. The boys, however, soon took to their bows and arrows, wandering off to hunt, and the girls learned at home the art of weaving baskets and making bread of acorns. Familiar with the points of the compass from infancy, they use their knowledge on all occasions; even in play, if a ball or an arrow is being searched for, the one who saw it fall will guide the seeker thus, "to the east," "a little north," "now three steps north-west," and so on. In the darkest night I have known an Indian go directly to a spring of water from a new camp by following the directions of a companion, who had been there previously, given perhaps as follows: "three hundred steps east and twenty steps north." This early training in woodcraft gives that consummate skill and confidence which are rarely acquired by those who learn them later in life. In tracking game they know the "signs," as our hunters call them, of the various animals and birds as well as they know the kind of game that made them, and experience teaches them when the animals moved away. In tracking white men they cannot make mistakes. The white man's foot is deformed, made so by the shape of his boots or shoes, and even when he is barefooted his toes are turned inwards. The Indian's foot, never having been compressed, has the toes naturally formed and straight as our fingers are, and he can even use them to hold arrows when he is making them. When he walks therefore, each

toe leaves its impress on the dust or sand, the imprint of the little toe being as straight, perfect and distinct as that of the largest. In summer the Indians are fond of travelling from place to place as fish or game, sunny nooks, or shady glens offer their attractions in turn, and this *living* in different places accounts in part, for the intimate knowledge they possess of localities and also of trails leading from one section to another.

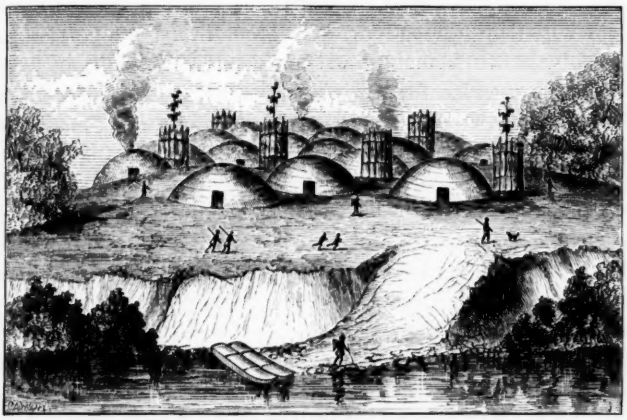
In the event of exposure to a severe storm when out hunting, or on a journey, the Indian does not risk his life by exhausting his strength. He selects the best shelter near him while he is comparatively fresh, and with bark or boughs, or under an overhanging rock, seeks protection from the wind. A hole sunk in the ground, and a small fire kept burning by an armful of sticks, will keep him warm till he can resume his journey. The Indians use great skill in their selection of fuel, and also in the disposition of the sticks in burning. They say of the white man "big fool, make heap fire and smoke, stand far off, look at him burn, while freeze." The Indian rejects green or wet wood and puts a few dry sticks together, with the ends towards a centre. This gives a free circulation of air between the brands, with but little smoke, and a large proportion of heat for the size of the fire. Their winter quarters are dry and warm, but are rarely free from smoke, which the Indians do not seem to regard as an inconvenience. The outside is covered with earth and at least a half of the hut is below the surface of the ground. The inside shows strong posts supporting an arched roof made of poles bound with grapevines, and these covered with reeds and coarse grass secured by cords. A small hole in the roof serves as a chimney, and a low door, usually on the south side, is kept open excepting in stormy weather. A raised platform of poles and reeds holds the skins and blankets used for bedding. These blankets, made from geese feathers woven so as to bring the feathers overlapping each other, are ingeniously made, and are a protection from wet or cold.

When the Indians leave their houses a branch is left in the door to show that no one is at home. The California Indians were more provident than most of the aborigines of this country. Large, round, upright cribs, made of poles and reeds, perhaps eight or nine feet high, contained their supplies of acorns. These cribs were neatly made and had a floor of loose reeds to keep the acorns from contact with the ground; they were estimated to hold two years supply of breadstuff, and were filled when acorns were abundant to provide for a short crop if the next year should prove unfruitful. The whole tribe, men, women and children, worked together in gathering acorns in the fall for these public granaries. The hunting and fishing were done wholly by men, and some of the fishing was done at night when the women were sleeping at home. Much of the drudgery came to the women and seemingly with their consent. They said that a hunter needed a keen eye, a firm hand and a fleet foot; if he became stiff from hard work or lost his skill, his wife must suffer with him in his misfortunes, and it was best for each to do what each could do best.

The position of honor among the Indians is the recognition of excellence in some quality or acquirement. This induces every young man to improve himself by every opportunity offered, so that he may become the first in usefulness and be called on to meet chiefs in council. When the customs of the Indians are learned the charge of indolence, as often made against them, does not seem wholly merited. One of the early settlers in New York asked a chief why he did not work and lay up money. The chief replied that he wanted one good reason given him why he should make a slave of himself all of his life to make his children lazy for the whole of theirs. The labor performed is often great and exhaustive and must be shared by many. As no one gains any advantage over his fellows, excepting as he may prove himself more useful to them by the exercise of superior skill, he has less inducement to work alone, as a

public servant. The Indian again has a desire to have game abundant, and to have the trees preserved for his acorns and fuel. It would seem folly to kill game faster than needed for food from year to year, and cutting down the oak that brought him acorns, would be killing the goose that laid the golden egg. An Indian to be judged fairly must be regarded as an Indian. Custom with them, as with civilized people, is law, and many of their customs have probably been transmitted, with but little change, from remote ages.

Fig. 35.



Indian Village.*

There is every reason to believe that the Indians were very numerous in California at some former time. Deserted mounds, showing the sites of former villages, are seen along the banks of the rivers, and a few tribes, speaking dialects of their own and yet living separately as nations, only consist of a dozen families each. One of these removed to a large tribe while I lived near them and remained as a part of the more powerful tribe for a year or more; but they became discontented or homesick, and returned to the village con-

* The grain cribs are scattered about among the huts, and the poles planted in some of them support the decoys used by the Indians in shooting geese. — EDS.

taining the dust of their ancestors. Here they kept up the traditions of their fathers, and related tales of former glory, and prayed to the Great Spirit for success and for abundant blessings. It is worth our time perhaps to consider, while speaking of the mounds that indicate the sites of villages, how much of the elevation is due to natural deposits, and whether it may not in many cases be entirely so.

The streets in the city of Chicago have risen from eight to ten feet above the old level during the past twenty-five years from the soil obtained from cellars, ashes, sweepings, etc. Even the villages (so called) of prairie dogs are made higher by their occupation. The ground used as a permanent home by human beings is constantly receiving additions from the wood used as fuel, bones of animals, shells of various kinds, and even the bodies of the California Indians were buried near their houses, with their baskets and implements used in hunting and housekeeping. I am aware that elsewhere mounds seem to have been heaped up by another race of people, but the highest that I have met with in California I think were owing to the gradual accumulations from centuries of occupation.

The traditions of the Indians are so fanciful, when they get beyond the history known to the living, that they differ but little from printed fictions.

Their religion is probably little changed from that of an earlier age. A Good Spirit is invoked to provide food and give prosperity, and evil spirits are to be propitiated. The oldest chief prays at certain seasons, morning and evening, outside of the council lodge, and sings in a monotone a few sentences only. This is not in words taken from their language, but is supposed to be intelligible to the Great Spirit. When special prayers are made for success in fishing or hunting, the request is made in plain Indian. Although he prays constantly for success, he uses wonderful craft and skill to ensure it. The antelope could not be approached in the short dry grass on the plains even by crawling, but the In-

dian whitens the sides of his body with clay, and puts a perfect decoy antelope's head on top of his own.* With a short stick in his left hand to give length to the pretended foreleg, and carrying his bow and arrows in his right, he pretends to feed contentedly on the grass until the antelope approaches sufficiently near for him to kneel and shoot. The hunter, when standing or walking, supports himself on the short stick held in the left hand, like an animal standing on three legs (Fig. 34). I found by adopting this decoy head, and wearing knit clothing, that the antelope would come to me readily if I would remain in one place and hold the head near the ground, as if feeding. It was more difficult to walk far in this way, and the antelopes would come to me at times when if I had attempted to go to them, they would have become alarmed.

To illustrate the ease with which an Indian can provide food for himself, I saw one come to the bank of Feather River one afternoon and start a fire. Turning over the sod and searching under the logs and stones he found some grubs. Pulling up some light dry reeds of the last year's growth he plucked a few hairs from his own head and tied the grubs to the bottom of the reeds, surrounding the bait with a circle of loops. These reeds were now stuck lightly in the mud and shallow water near the edge of the river, and he squatted and watched the tops of his reeds. Not a sound now broke the quiet of the place; the Indian was as motionless as the trees that shaded him. Presently one of the reeds trembled at the top and the Indian quietly placed his thumb and finger on the reed and with a light toss a fish was thrown on the grass. The reed was put back, another reed shook and two fish were thrown out; then still another and the fellow was soon cooking his dinner.

The spearing of salmon by torch-light, is very exciting.

*This is the real skin of an antelope's head with artificial horns made from tulé covered with a paste composed of the bulb of the soapweed pounded with charcoal; the eyes are made of the skin stripped from the back of a woodpecker, with the purple black feathers attached.

It is done on moonless nights and usually in parties of three to each canoe. One Indian guides the boat, a boy kneels in front with a blazing torch held near the surface of the water, while the one with the spear watches for the flash of the salmon as he darts toward the light. The spear is a loose point of bone with a hole through the centre, and one end fitted in a socket at the end of a light strong pole, and secured to the staff by a cord through the centre of the bone. When a fish is struck the bone is drawn out from its socket and left in the fish, making what sailors call a "toggle," the cord holding it in spite of its struggles. When the Indian is about to spear the salmon, you see him to advantage, and he gives his orders full of earnestness. "Hoddom! Hoddom! Pue-ne! Pue-ne! Hon-de! Hip-pe-ne! Mip! Mip! Wedem-pou!" as the struggling fish is drawn to the canoe. These words translated are: There, there! East, east! Lower! Higher! Hold, hold! The last word is an exclamation of surprise.

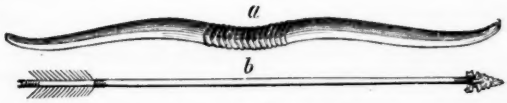
No christian has stronger faith that his Father will provide for his wants, than these Indians had that the Great Spirit would send the salmon into their nets, or the grasshoppers to vary their bill of fare. Although grasshoppers are regarded with dread by the white settlers in some sections, the Indians go out to meet them rejoicing. They pile up the dry bunch grass for a centre and then forming a wide circle, and swinging branches of trees, they advance driving the swarms of grasshoppers, until they take refuge under the pile of bunch grass. The grass at every point is set on fire simultaneously, and burns like gunpowder. When the smoke has rolled away the roasted grasshoppers are picked up by the basket full.

The division of fish and game was made generally by a chief, who counted out as many portions as there were families to eat. If no objection was made to the size of any portion, one of the number turned his back and called out some name as each lot was pointed out by the chief, the Indians

removing their share as fast as called for. No complaint was made if some were sharers who had not been workers, and hospitality to those entering their lodges was universal.

The Indians hunt for one kind of game only at a time, and each kind when they can be taken most advantageously.

Fig. 36.

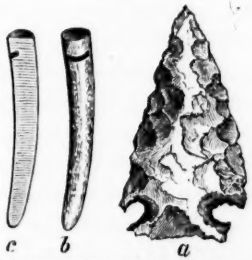


a The bow unstrung, from the Museum of the Peabody Academy.
b Arrow with head of obsidian, from the same.

When I saw every kind of game represented together at the Indian encampment in Bierstadt's celebrated painting of the Yosemite, I knew the camp had been introduced for effect, from this evident ignorance of, or disregard for the habits of Indians.

The Indian bow (Fig. 36) is made of the tough mountain cedar, with a thick back of sinew. A string of sinew also enables him to draw an arrow nearly to its head before it is sent humming through the air. The arrows are of two kinds, those with a head of hard, pointed wood for common use and those (Fig. 36*b*) reserved for extreme cases of attack or defence, having points of agate or obsidian, which are carefully kept in the skin of a fox, wild cat or otter. The stone arrow-heads (Fig. 37) are made with great care, and the materials from which they are made are often brought from long distances. Obsidian and agate are probably selected not so much for beauty of coloring as for their close grain, which admits of more careful shaping. They use a tool with its working edge shaped like the side of a glazier's diamond. The

Fig. 37.

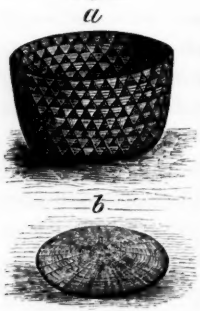


a Arrow-head of obsidian, from the Museum of the Peabody Academy.
b Instrument for chipping the obsidian.
c Section of the same.

arrowhead is held in the left hand, while the nick in the side of the tool is used as a nipper to chip off small fragments. An Indian usually has a pouch of treasures consisting of unfinished arrowheads or unworked stones, to be slowly wrought out when industriously inclined. The feathers are so placed on the arrow as to give it a spiral motion in its flight, proving that the idea of sending a missile with rotary motion is older than the rifling of our guns.

It would consume too much space to describe all their implements, and many of them do not differ materially from those that were used by Indians in this section; among them were awls of bone, thread of deer sinews, and cord which they used for their nets, bird traps, and blankets; — this cord was spun from the inner fibre of a species of milk-weed. Their cooking utensils were made from the roots of a coarse grass. These roots grow near the surface of the ground, and in sandy soil can be pulled up in long pieces. The pulpy outside skin is removed and the inside is a woody fibre, extremely tough when green, and durable when made into articles for daily use. The Indian women split these roots into thin strips, keep them in water when they are making baskets, and take them out one at a time, as needed. The water basket is first started from a centre at the bottom, and is added to stitch by stitch, without a skeleton frame to indicate the intended size (Fig. 38). A loose strip of grass root is added constantly as a new layer to the last rim, and this is sewed on with another strip of the same fibre to the finished work beneath, a bone awl being used to bore holes through the basket portion. The last rim or complete edge of a basket has a larger filling, consisting of several strips of split grass roots, or sometimes a willow stick is used. The larger baskets are ornamented with

Fig. 38.

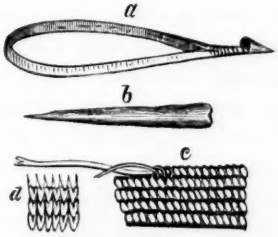


a Cooking or water basket.
b Flat mat used as a plate or tray, and this also shows how the bottoms of the baskets are formed.*

* The radiating lines in this figure are incorrect.

figures woven in of a darker color; the girls sometimes add beads and feathers for smaller baskets (Fig. 39). The conical baskets used for carrying burdens is *woven* instead of being sewed together, and is of looser texture and lighter in weight (Fig. 40). They are quite durable, however, and are used to carry wood, acorns, or household goods on a journey. The water baskets were also durable and would hold hot water.* Water was made to boil in them by dropping in stones previously heated. The women skilfully used two sticks in handling hot stones or coals as we would tongs.

Fig. 39.



a The yoke used to carry the conical basket.
b The awl used in sewing the basket.
c Fragment of basket from the Museum of the Peabody Academy, showing the character of the stitch used on the outside.
d Inside view of the same, showing that each stitch from above run diagonally through the one below it of the last series, and is brought out between the threads on the outside.

Fig. 40.

Woman carrying a burden basket.

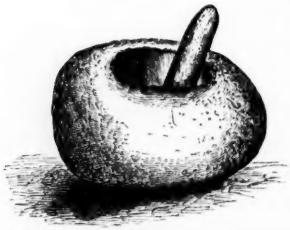
In bread making the women pounded the acorns between two stones, a hollowed one serving for a mortar (Fig. 41), until it was reduced to a powder as fine as our corn meal. They removed some of the bitterness of the meal by scraping hollows in the sand and leaching it, by causing water to percolate slowly through it. To prepare it for cooking the dough was wrapped in green leaves and these balls were covered with hot stones. It comes out dark colored and not appetizing, but it is nutritious and was eaten with gratitude by Fremont's men in 1844. Fish and meat were sometimes cooked in this way. A salmon rolled in grape leaves and surrounded with hot stones, the whole covered with dry

*A shallow basket of their work, which has been in the Museum collection for years, now holds cold water as perfectly as when it was made. — EDS.

earth or ashes over night and taken out hot for breakfast, does not need a hunter's appetite for its appreciation.

Marriage among the California Indians was similar to that of other tribes in other parts of the country. Presents of sufficient value were given by the man to the girl's parents, and the bride might be given away without her knowledge or consent. From my own observation I know that the Indian uses the best of his judgment in making a selection, and desires neither family strife or misery in his lodge. Girls are married at thirteen or fourteen years of age, and no woman of marriageable age remains single long. Most of the Indians, who became personally well known to me, were very happy in their family relations, and the custom of dividing food equally among them, allowed no family to suffer from want.

Fig. 41.



Stone mortar and pestle, from the Museum of the Peabody Academy.

When the whites first came into the country the Indians were virtuous and happy, and if whiskey had not demoralized them they would have retained much of their original independence and self-respect. They were naturally cheerful and attached to each other, and although polygamy was permitted I knew only one chief who had two wives. These seemed to agree, although Waketo said of his family that it had "too much tongue."

In earlier days dancing among them was confined to ceremonies of different kinds. In some of these the women joined, forming themselves into a circle; but as only one step was used in a solemn way, accompanied by a half turning of the body, a stranger might be in doubt whether it was rejoicing or mourning. Within this circle the men danced with great activity, leaping across a fire burning in the centre, and yelling and singing whilst the women

continued their solemn dancing, singing a low monotonous chant.

Running of races was confined, after childhood, to the men, and endurance rather than speed sought for. A race was for three or five miles at least, and a good runner would follow a runaway horse or mule that had started off with greater speed, but in a few hours would return with the animal in his possession.

The Indians were inveterate gamblers, and parties from one tribe would visit another for several days at a time and play day and night. The game was a sort of an "odd and even," as played by white children, the parties guessing as to the number and position of the sticks used in the game. The playing was accompanied by singing, and beads were principally used for stakes.

In the treatment of diseases the Indians succeeded in a certain class of them, but failed altogether in others. The pain from a sprain or rheumatism would be drawn to the surface by burning the skin with fire. I can testify to a cure from this remedy. A severe sprain of an ankle, followed by two months use of crutches, resulted six months later in rheumatism in one of my feet. The assertion of a chief that fire would cure it in an Indian, but for a white man—and here he shrugged his shoulders as if words were unnecessary—induced me to try the experiment, and show him that white men could bear pain. I placed a live coal on the top of my instep, and before the burn was healed my rheumatism was gone. For headaches they pressed their hands on the head of the sufferer and sometimes cured it by gentle pressure. For other diseases they tried steam baths, especially for colds. When any internal disorder defied their treatment, they immediately begged medicine from the whites.

In burying the dead a circular hole was dug and the body placed in it, in a sitting posture, with the head resting on the knees. If a man his nets were rolled about him and his

weapons placed by his side. If a woman her blanket enclosed her body, and a conical shaped basket, such as they carry burdens in, was put in the grave also, with the peak upwards. The widow of an Indian cut her hair short and covered her head with ashes, and in the mountains they used tar for that purpose. Every night for weeks, after their bereavement, the wails of these women were distracting. I do not know the exact time prescribed for mourning but I do not think it lasted more than six months.

The language of the California Indians is composed of gutteral sounds, difficult to separate into words when spoken rapidly, and hard to pronounce or remember. The counting is done, as with all primitive people I have met, by decimals. Children in reckoning call off the fingers and toes of both hands and feet as twenty, when wishing to express a large number. In counting ten the following words are used: Weekum, Paynay, Sarpun, Tchuyum, Marctem, Suckanay, Penimbom, Penceum, Peleum, Marchocom. If eleven is to be expressed it is Marchocum Weekum, or Ten one; Marchocum Paynay, ten two, and so on to twenty which is Midequekum. The general term for man is Miadim, and for woman Killem, and for a child Collem. A boy is Miadim collem and a girl Killem collem. Although this seems to indicate a poverty of distinctive terms, yet when it is found that every animal, bird, insect and plant has its own name, it will be seen that there is no want of materials to supply a stranger with words for book making, if his tastes lead him in that direction.

After many years passed with these Indians, and having every opportunity to study their customs and character, I entertain pleasant recollections of their friendship which was never broken, and feel sadly when I realize that the improvements of the white men have been made at the sacrifice of Indian homes and almost of the race itself.

Feather River (Rio de Plumas), before its mines were washed for gold, was so clear that the shadows reflected on

its surface seemed brighter than the real objects above. The river abounded in fish, as did the plains on either side in antelope, deer, elk and bear. The happy laughter of children came from the villages, the splash of salmon, leaping from the surface, sent ripples circling to the shore, and the blue dome of heaven was arched from the Sierra Nevada with its fields of snow on the east, to the distant Coast Range that shut out the Pacific on the west. Grand oaks, with far spreading shade, dotted the plains that stretched for miles on either side, and in spring time the valley was brilliant with flowers. This was the possession and home of the Indians, whose ancestors had lived and hunted without patent or title obtained from deeds, long before the first sailor planted his flag on the sea-coast and claimed the country by right of discovery. It could not be expected that the Indian would see his trees cut down and game destroyed, and the clear rivers turned into muddy streams, without regret. That they refrained from seeking satisfaction for what they regarded as intentional wrong is more surprising.

A white woman told me one day of her spirit in driving an Indian from her tent, by getting out her husband's pistol and ordering him to "vamose." The Indian's story was heard in this particular case, and never having seen a white woman before he was astonished at her hostile intentions, and indignant at having been threatened when he intended no wrong. He added that he knew now "why so few of the white men in California were married."

The Indians are philosophical by nature and accept either death or suffering, when regarded as inevitable, with composure. On one occasion, when talking with a chief, and slapping mosquitoes with considerable energy, killing them when I could, the Indian remained cool and serene, quietly brushing the little torments from his limbs, and observing my impatience, said, "what good comes of killing a few, the air is full of them." When the first steamboat passed the Indian villages I watched the Indians to see what effect

it would produce, but to my disappointment it did not excite them or elicit any expression of wonder. Even the steam whistle failed to move them; they did not understand it and would not exhibit surprise. Two years later a brig sailed up the river and the Indians were full of excitement. The size of the sails and the strength of the ropes came within their comprehension, filling them with wonder. The task of gathering fibre enough to weave so much cloth, and such ropes, made the white man a wonderful worker in their estimation.

It has been customary to attribute certain general qualities to whole tribes of Indians, and this has been done to those of whom I have written. I can only say that no two Indians of my acquaintance were alike, and their mode of life would naturally develop individuality of character.

The charges of lying and stealing, as urged against them, have some foundation in fact, although the Indian might make some such defence as our soldiers made to the accusation of theft of honey and chickens while marching through the South during our late war. They did not steal, they *took* what they wanted and expected to live on the enemy. No Indian can steal from his tribe, however, without losing his character, and their desire to have position in the tribe makes both men and women as careful of their reputations as those in civilized life. Indians and white men cannot live side by side happily, nor without fighting till the white man is acknowledged master. The Indian is cat-like, attached to localities, and kills only such game as he needs for food; he is stealthy by nature, and patiently waits his opportunity to strike. The white man is migratory and carries his attachments to strange lands, making his home where his ambition or nature attracts him, and is destructive alike to game or forests. The Indian, if he become an obstacle, is classed with wild animals, and is hunted to the death; this antagonism becomes mutual and is perhaps as natural as the antipathies of cats and dogs.

The early settlement of New England was attended by the horrors of Indian warfare, and this struggle is the same to-day as then, but farther west on the plains of Colorado and Arizona. The Indians of California are now fed on government rations, and instead of elk and antelope the land is grazed by herds and flocks of domestic animals owned by the white men, and enumerated and taxed as one of the largest items of wealth in a rich state. The present policy of the government of removing Indians from disputed lands, and settling them upon reservations, is perhaps the best thing that can be done, but much of the management of Indians in the past has been a shameful record of fraud, by the agents of our government who represented the public money-bag, and of outrages committed on emigrants by the Indians.

Many of the Indian agents, in their greed for gain, supplied hostile tribes with rifles, ammunition and whiskey in exchange for furs and even property captured from the white settlers. Whisky that may only make a fool of the white man converts an Indian into a fiend, and when drunk he may kill friend or foe. The individual settler, exposed to attack, regards the Indians as brutal and dangerous, and loses faith in his government if it rewards with presents the wretch who has murdered his companions, and may at any time attack him by surprise and butcher his wife and children.

Our government is now powerful enough to warrant the exercise of authority and mercy. It is folly to purchase peace of such a people by paying them tribute, as the Indians themselves seek to propitiate evil spirits by gifts of beads; and it cannot be right to make "Black Kettle" a present of a Colt's revolver, after he has already used his rifle and knife on more white victims than any brave of his tribe.

The Indians whom I have particularly described in this paper, have been shown to possess the virtues of generosity and hospitality without the least knowledge of Christianity, and

it is a mortifying fact that the early explorers in this country generally found welcome and hospitality among the Indians before the white traders had corrupted them. Now it is difficult to find a tribe that a white man cares to visit unless with the balance of power on his side. Indian cunning even has not proved equal to the duplicity of the white man. You may have heard of the Indian who offered his beaver skins for sale to a trader in olden times in one of our Puritan villages, when the trader was on his way to church. The trader would not purchase then, but in a whisper stated a price. When the church was dismissed the Indian followed the trader home and demanded payment for his skins, but was forced to accept a less price than was first named. The Indian took the money but told an acquaintance that he had discovered the use of the big meeting at the church, — "it was to lower the price of beaver skins."

As a white man I take the side of the pioneer in defence of his family, but I wish the Indians could have been spared much of the degradation brought upon them by bad white men that must eventually end in complete subjection, or extermination.

NOTE. All the figures not otherwise designated, are drawn from memory. — EDS.

THE TIME OF THE MAMMOTHS.

BY PROF. N. S. SHALER.

WE must ask the reader to go with us into the remote past; back beyond the time when man invaded the primitive forests and disturbed the abundant life which covered the prairies around the great inland seas of our continent; still farther back until we come to a time when very different animals from those now living there, roamed those woods and fields. We thus come to a time remote when measured

by the usual standards of duration, yet only a geological yesterday. Once such journeys as we propose making were very difficult, and attended with dangers to soul, if not to body, which might well make any but the stout hearted investigator hesitate. But now that the wall, which once divided the preadamic time from the present, has been so frequently breached and trodden over by those bound on expeditions into an even more remote past than that to which we seek to penetrate, we may set out on our journey without fear of meeting with a reception, on our return, which might make us wish that we had stayed among the monsters of that ancient time.

We will not strain the imagination of the reader by asking him to conjure up a picture of land and sea unlike that given by our present continents and oceans. He need not flatten out mountain chains, or dry up river systems, in order to represent to himself a true picture of the theatre which bore the actors of the scenes we are about to describe. Our good old continent was much the same then as now. All the changes which have taken place would fall within the limits of error of the maps of the past few decades. The unceasing agents of change operating through water, have done much work; but a little longer delta to the Mississippi, a somewhat greater projection of Florida to the southward, a lessened area of the great lakes of the north-west, are about all the more important changes which have been accomplished since the time of which we speak.

In order to come in contact with living elephants and mastodons, we need not go so far into the history of our continent as to traverse the glacial period. Long after the time when this great ice envelope shrouded the northern half of this continent, the great pachyderms continued to form the most important feature in the life of our continent. If we wish to go back to the time when these great animals first came into our fields and forests we must ascend much farther into the past, beyond two or more glacial periods,

with the long intervals of repose between them. During the middle and later tertiary periods elephantine life had its highest development; a half a dozen or more species lived then on the surface of the European continent, and only a portion of the then existing forms may be known to us. The importance of the elephant life of this time may be better estimated by comparing the number of large mammals belonging to any one family now existing in the same area. Only three or four species of the family of cervidæ, to which the common deer belongs, have existed in Europe since the glacial period. Among the bulls not more than two species are known to have lived during the same time. Nor among the large carnivora, the bears or wolves, have the species been more numerous. We must seek among the smaller of the existing mammals, among the squirrels or mice, for the same richness in specific representation as we find among the elephants of the tertiaries. The variety in size and form seems to have been very great; the smallest species was not over three or four feet high, while the largest stood as high as any of our living elephants, towering to the height of ten or twelve feet. We know too little of the geology of the other continents of the old world to say whether this exceeding richness in large elephants at this stage of the earth's history was also found there. We know, however, that India, where one of the two remaining species of elephants lives, was thronged with these animals at this time, and although Africa was probably then separated from the other continents with which it is now closely united by seas of considerable width, it, too, probably bore an abundance of the same life. We do not know the character of the life of the middle tertiary time in North America with anything like the accuracy that we do that of Europe during the same time. The investigations which are to enable us to form a clearly defined picture of the life of that time, on our own continent, are yet to be made. It seems likely, however, that during the time when elephants were so remarkable a feature in the life

of the old world, the new world was inhabited by quite different forms of pachyderms. The beds of the Mauvaises Terres, and neighboring country so astoundingly rich in animal remains, have supplied us with more species of fossil horses than are known from all the rest of the beds of that period. Altogether the middle and later tertiaries of North America have supplied us with the remains of at least ten species of fossil horse-like animals; so that the comparatively unexplored regions of North America have yielded more tertiary horses than all of every age and formation which have been found in other regions.

When we come down to dates nearer to our own time, and only separated therefrom by the last ice period, we find evidences that the European elephantine life still continued, though the species had changed, there being no longer so considerable a number of distinct forms as then existed. We are not yet quite certain whether the elephant remains of Siberia come down to us from a period anterior to the glacial epoch, or whether they were stored away in that frozen soil during or since that time of extreme cold. All analogy with the remains found in other regions, lead us to conclude that these herds of elephants, whose remains are found in such abundance around the mouths of the great rivers of northern Asia which empty into the Arctic Ocean, are contemporaneous with those of the closely allied, if not identical, species found in the peat swamps and morasses of North America. The number of these fossil elephants which are to be found in northern Asia is as remarkable as the condition in which they have been preserved. The ivory which they have left strewn over this region has been for centuries an important article of commerce, a large portion of the Chinese supply being probably derived from this source. There can be no doubt that the elephant life of this region was once as abundant as that which now exists in the jungles of Ceylon, or the southern part of Africa.

The peculiar circumstances under which many of the bod-

ies of the Siberian elephants have been preserved, enables us to form an idea of the external form and habits of the creature far more satisfactory in its character than that which we have of any other extinct animal, except a few which have been exterminated by the hand of man.

Generally the geologist is compelled to effect the restoration or rebuilding of the form of the extinct animal from fragments of a skeleton, the gaps of which he must fill by inference, and this conjectural framework is afterwards to be thrown into a more or less imaginary outline of soft, enveloping parts. He is only too thankful if he finds that decay has left him a tolerably fair basis which he may build his labor upon. But in the case of many of the Siberian elephants the preservation is perfect; not only the skeleton, but the whole mass of the soft parts; the external envelope of skin, with its protecting covering of hair; even the delicate and perishable structures of the eye, an organ which so quickly perishes when decay begins to work, are all in an unchanged condition. Nor is the preservation that of form alone; the chemical condition of the body is unchanged, it is still flesh and blood; its imprisonment in the ice of the frozen soil of the Lena delta for an hundred thousand years, more or less, has not perceptibly changed its constitution; animals feed greedily on this flesh which has endured twenty times as long as the historical record. The dogs and wolves gather from afar to the feast whenever one of these bodies is uncovered, and there seems no good reason why those abnormal appetites of Paris, which find a new titillation of the palate in every monstrosity of diet, should not get a sweeter morsel from these preadamic elephants than they have obtained from their choice pieces of the knackers yard. Fortune certainly awaits the next rival of the *bois treres Provenceaux*, if he will bid for it with elephant steaks from Siberia. The many ingenious inventors, who seek to find a means of preserving substances liable to perish by decay, who are constantly endeavoring to solve the problem of how

to bring the surplus food of South America to the hungry mouths of Europe, may take a profitable lesson from these Lena elephants. Freeze the object to be preserved from decay in a block of ice; retain this in a frozen state and the entrance of the dreaded agents of change is at once barred. The conditions of permanent preservation are obtained; air is excluded; that which is within the substance is locked with the water and can act no farther. These are the simple conditions which have kept the Lena elephants unchanged, while the very vegetation which supported them has been swept away; and by observing these conditions we might have preserved the body of Cæsar himself unchanged to the present day. Who knows but that following the simple method here indicated, the forms of the illustrious dead may yet be preserved from generation to generation, giving a tangible chain to connect the too forgetful present with the past. What could so preserve the memory of a time as one of its chief actors sleeping before our eyes cased in crystal ice? Would not the world be richer if we could have before us the earthly habitations of a Dante, a Shakspeare, or an Humboldt, as they were left by their immortal selves? He who entered the cold depositaries of such precious relics could not come forth without feeling that he was closer wedded to a distant past than ever before. The author does not feel free to advise this Siberian treatment of our ancestors, as he is not sure but death should be followed by decay; but to those who think that the closer our relation to the past the better fitted we are for the work of the present, it must commend itself.

But to return to our elephants. The peculiar interest which is attached to the discovery of the well preserved remains of the only one of these animals which has come under the eye of a naturalist, warrants the transcription of the whole statement of the circumstances of its discovery.

This important discovery was made by the Chief Schumachoff, of the wandering tribe of Tunguzes, near the mouth

of the river Lena. The following account is translated and condensed from the description published in the "Memoirs of the St. Petersburg Academy of Sciences."*

"In 1799 he built a cabin for his wife on the borders of the Lake Oncoul, and then went to search on the shore of the northern sea, hoping to find some elephants tusks. One day he perceived in the midst of the ice cliffs a shapeless mass, which did not look like the heaps of drift wood which are often found there. In order to examine it more nearly, he came ashore and observed the object on all sides, but could not recognize what it was.

The following year he discovered at this point a sea cow, and saw at the same time that the mass which he had seen before was farther separated from the ice, and showed two long projections, but he could not yet determine what it was. Towards the close of the following summer the whole side of the animal and one of the tusks projected beyond the ice wall of the cliff. On his return to the shores of Lake Oncoul he communicated the result of this discovery to his wife and to some of his friends; but their way of looking at the matter gave him much distress. The old men told him that they had heard their fathers say that once before a similar monster had shown itself on the same peninsula, and that the discoverer and all his family perished soon afterwards. The mammoth was consequently looked upon as an augury of a dire calamity, and the Chief was so much affected that he fell very ill; but at last, being a little convalescent, his first idea was of the profits he might gain by selling the tusks, which were of extraordinary beauty and size. He gave orders to have the locality carefully concealed, and all strangers turned away on some pretext, charging at the same time some of his people to watch carefully that no one should steal his treasure.

But the summer was less warm than the preceding, and the mammoth remained buried in the ice which scarcely melted at all. At last, towards the close of the fifth year, the ardent desires of Schumachoff were happily accomplished. For that part of the ice which was between the ground and the mammoth having melted more rapidly than the rest, the surface became sloping, and this enormous mass, pushed by its own weight, slid down and sorted on a bank of sand upon the shore.

In the month of March, Schumachoff came to his mammoth, and having cut off his tusks sold them to a merchant for goods worth fifty roubles.

Two years afterwards, consequently soon after the discovery of the mammoth, and fortunately in travelling through this country I was able to establish these facts which one would have believed so improbable. I found the mammoth still in the same place, but entirely mutilated. The Jacutes of the neighborhood had cut up the flesh and fed it to their dogs during a period of scarcity, and the wild animals, white bears, wolves,

*De Skeleto Mamonteo Siberico ad maris glaciales littora anno 1797 efosso, Auctore Tilesio. Mem. Acad. Imp., St. Petersburg. Tome v.

gluttons and foxes had picked the bones. The skeleton, almost entirely stripped of the flesh, was still entire with the exception of one forefoot. The spine from the head to the coccyx, a shoulder blade, the pelvis and the remains of the three extremities were still attached by cartilage. The head was covered with a dry skin. One of the ears was very well preserved, and furnished with a tuft of hair. All these parts have naturally suffered by transportation for a distance of eleven thousand werst. Still the eyes have been preserved, and in the left the ball is still visible. The brain remained in the skull, but seemed somewhat dried. The parts the least injured are one front and one hind foot; they were covered with hair, and had still the soles. According to the assertion of the Chief the creature was so fat that the belly hung down to below the knees. *The neck bore a long mane.* The skin, of which I collected about three-quarters, is of a dark gray color, covered with wool and black hair.

The escarpment from which the mammoth had slid had a height of from two hundred to two hundred and fifty feet, and is composed of clear, pure ice. It slopes towards the sea and its summit is covered with a coating of moss and friable earth about eight inches thick. During the heat of summer a part of the crust melts, but the rest remains frozen. Curiosity caused me to climb two other hills somewhat away from the shore. They were composed of ice also, and less covered with moss. At various points one saw fragments of wood of great size, and many tusks of mammoths imbedded in the ice precipices."

The peculiarities of the geographical distribution of organic life makes us associate certain animals and plants with certain features of climate. So that the inference was naturally made that the remains of elephants and rhinoceroses indicated a climate of a tropical character in the region where they are found at a time when these extinct species were living. That this is entirely fallacious is sufficiently proven by the fact that our Lena elephant is fitted to resist just such a temperature as now prevails in the regions where his remains are found. The hairy envelop afforded a nonconductor such as does not exist on the skin of any living animal outside of the Arctic circle. In place of the imperfect hairy covering of hairy pachyderms, or the bare skin of his living congeners, this elephant was provided with three distinct suits of hair and wool, the longest bristle-like hairs having various lengths up to a foot and a half, and serving the ruder purposes of defence; the next and shorter coat was a close set, tolerably fine hair, three or four inches long; within

this, in itself a considerable protection against the weather, lay a coating of wool, fitting the intervals between the other hairs, and enabling the animal to withstand the greatest rigor of the climate, which now prevails in this part of Asia. Acute observation has supplied us with another evidence of the fitness of this elephant to live in the ordinary conditions of high latitudes. In the tooth of the specimen, before described, was found a morsel of wood, the remains of the last meal made by the creature; the microscope of the botanist showed this fragment to belong to a coniferous tree, so that the stunted furs of the high north might have supplied food for herds of these mammoths. It is not, however, quite certain that these animals ever came down to the borders of the northern sea, though, as we have seen, they were fitted for such a climate as now prevails there; so far as we know the remains which are found around the mouths of the great rivers of Siberia are always in a position, which seems to indicate that they have been swept into their places by the river, and may thus have come from any point on its course. The fact that spring overtakes the stream at its headwaters, filling its channel with the floods of the annual melting, while the region near the estuary may be still frozen solid, renders these Siberian rivers, as all other streams which flow towards higher latitudes, peculiarly liable to destructive overflows. Overtaken by these inundations these clumsy inhabitants of this region were swept down towards the sea and stranded on the perpetually frozen soil of the shore; here buried in the mud and ice they soon became frozen, and each successive inundation thickened the sheet of ice and frozen soil which sealed them from decay. Nothing but a change of climate or an alteration in the course of the stream in such fashion as to disinter the remains can ever disclose the innumerable bodies of these ancient monsters which lie stark and stiff along the waters of that frozen sea. When the frequent disinterment of these valuable fossils, by the falling of the frozen cliffs of the rivers of Siberia,

are more closely watched, we will doubtless obtain similarly preserved bodies of the other large mammals which were contemporaneous with these elephants. It would be contrary to all analogy to find that these great pachyderms held these vast steppes of Siberia unassociated with other large mammals. We may reasonably expect to find a whole fauna of creatures fitted to the rude conditions to which we have seen this elephant is adapted.

Unfortunately we know too little concerning the fossils of the extreme northern part of North America to be able to say whether the Siberian elephants were peculiar to the Asiatic border of the Arctic Ocean, or extended over the northern part of this continent. All analogy in the distribution of life around that sea, at the present day, would lead us to expect that the same, or allied species, ranged all along our northern shore. The Mackenzie River being subject to just such a peculiar overflow as has embedded the elephants of Siberia in ice, we can hope that when its shores are better known there will be similar fossils found there. There seems to have been an obscure tradition among some portions of the Indians of eastern North America, that on the unexplored and distant recesses north of Lake Ontario and the St. Lawrence, there dwelt some great mammals which had a size like that of the elephant. With the early voyagers this was accepted as proof that the mammoth still lived in the western part of Labrador; and on some of the first maps this territory was laid down as the habitation of these surviving members of the giant race whose bones strewed the surface of so large a portion of the continent. It is to be expected that the Indians, who must from time to time have encountered skeletons of the mastodon and elephant where they had been unearthed by the changes of river courses, or brought to light in their efforts to free the obstructed course of large springs, such as those at Saratoga or Big Bone Lick, would have believed the species still living, and have assigned it a home in some distant region. A savage conceives with

difficulty the extinction of any species of large animal, but if it fails to cross his path is disposed to assign it a home in the region least known to him.

So far as is known to the author no remains, either of elephants or mastodons, have been found north of the parallel of forty-eight degrees east of the Rocky Mountains. South of this line the remains are found in tolerable abundance over the whole surface of the eastern United States as far south as middle Alabama. We have not sufficient evidence of the distribution of the remains of these animals to determine just what range they had. New England has given us the fewest remains, only rare traces of the presence of this species having been found. In the valley of the Hudson they are tolerably abundant. In New Jersey, where the conditions favorable for their preservation are frequently found, some of the most perfect skeletons have been disinterred. All over the middle states we come across traces of this species; and in the West, they are the most abundant of mammal remains. On the Pacific coast, the fossil elephants were as numerous as in the Mississippi Valley; on this side of the continent they seem to have a greater northern range. The explorations of Mr. Dall revealed the existence of these remains as far north as Alaska; so that on the west coast at least, we have the remains of American elephants as far north as those of Siberia. The existence of these remains in Alaska makes it exceedingly probable that we shall find the similar fossils throughout British America, and that our mammoth is specifically identical with that of Asia. It is remarkable that the buffalo, which once ranged far east, and covered the whole of the plain region of the Ohio basin with innumerable herds, has not left as many traces of his presence as the elephants. The remains of the mastodon seem even more plentiful than those of the red deer. Something must, no doubt, be attributed to the greater size and solidity of the bones of these pachyderms over those of bison and deer. Still the remarkable abundance of the elephant re-

mains is indubitable proof, not so much perhaps of the abundance of the individuals at any one time, as of the long continuance of the species on the soil. The buffalo was a temporary race on the Ohio Valley; he had probably been here only a few thousand years at most, possibly but a few hundreds, when the coming of the white man drove him beyond the Mississippi. He was not there at the time of the mound builders. His bones are not found among their remains. His striking form is not copied in their pottery, as are those of all other remarkable mammals of the valley. Nor do we find him delineated in the great figure mounds of the north-west; although if he existed in the region at the time when these people made these earthern monuments, he would have been sure of a prominent place among them. The elephants and mastodons, on the other hand, had a life which may possibly be reckoned by hundreds of thousands of years. A species was probably here before the glacial period; and since that time up to about the coming of man, possibly after his advent on the continent, they were continually present. The consequence is that their remains are found in about every spot where the conditions of their preservation exist. Almost any swampy bit of ground in Ohio or Kentucky where these huge creatures would have gotten mired in their efforts to get to water in dry seasons, or where the too yielding mud could have swallowed them up when they endeavored to cool themselves by wallowing in the mire, as is the habit of all elephants, contains more or less evidence of the presence of these animals. Sometimes a single tooth or tusk only has survived decay; at other times many skeletons are packed together in the bog. The numerous salt springs of the West, commonly called licks, are peculiarly rich in these remains. Like many other mammals these elephants were in the habit of seeking once a year, or oftener, some place where they could supply the hunger for salt. The saline waters, such as pour from Big Bone Lick, the upper and lower Blue Licks of Kentucky,

or other similar localities in the West, supplied this need, and here came, on an annual pilgrimage, all the large animals of the country. When this region was first occupied by the whites the bones of elephants and mastodons were found in abundance upon the surface, or buried beneath a thin covering of mould around the various springs of the first of these localities. For nearly half a century they supplied every strolling curiosity hunter with relics, besides furnishing the remarkably perfect specimen in the British Museum, as well as half a dozen less complete skeletons. There remain to this day traces of the ancient paths on which at the time the country was settled the deer and buffalo thronged to their favorite watering place. These traces, broader than a wide bridle path and worn to the depth of several feet, were fifty years ago the natural roads, leading from great distances, down to the springs. The buffalo evidently fell into the paths made by their predecessors, the elephants; for along the courses of these paths the mammoth remains seem most abundant. Although some of the remains of the *Elephas primigenius* give evidences of extreme antiquity, others seem comparatively very recent. The author has a tooth of this species which came from the uppermost terrace of the alluvial plain opposite Cincinnati, at a point over sixty feet from the surface. This tooth could not have been placed in its position less than fifty thousand years ago. Since the deposition of the beds where it lay the Ohio has deepened its rock channel over fifty feet, and shrunk to the mere shadow of the mighty stream which flowed through its valley when it bore the melting ice of the drift period. On the other hand some of the remains of the same species, such as those which lie upon the surface at Big Bone Lick, are so well preserved as to seem not much more ancient than the buffalo bones which are found above them. There is a great difficulty in determining the relative antiquity of the two elephants which have existed in the United States since the glacial period. The *Elephas primigenius* (if the species

be identical with the European representatives) seems on the whole to be more ancient than the *Mastodon Ohioticus*. It was beyond all question in existence when the upper terraces of our river bottoms were being formed, which must have been just as the ice sheet was passing away from the Alleghanies and was flooding our Western streams with its waters. This mastodon on the other hand seems never to be found under circumstances which indicate such great antiquity; it seems to have come in after the details of the river courses were about complete and all the terraces formed. There can be no doubt, however, that these two giants were associated during the latter part of their history. Although it is quite unusual for two allied animals of very great size to exist together in the same field, there is no reason why the Western world could not have been broad enough for both. There is sufficient difference in the structural features of these two races to warrant the supposition that they must have been characterized by considerable difference of habit and instinct such as would lead them to choose different fields of activity. It seems not unlikely, though the evidence is hardly sufficient to support the assertion, that the mastodon was most given to wandering in the swamps, while the elephant ranged on higher grounds.

The *Elephas primigenius*, or mammoth, was considerably taller than the Indian elephants of to-day, though not much exceeding them in length. The most striking differences of form were to be found about the head, which was considerably higher and more pointed than that of the Indian elephant, and provided with tusks, which instead of projecting downward and forward, curved quite abruptly outward and backward. The size of these tusks far exceeds those of any living elephant the author has measured; tusks of our North American mammoths have been found having a length on the outside of the curve of over ten feet, yet wanting both tips and bases. The perfect tusk must have been over eleven feet long. In

addition to the greater length of the tusks the mammoth was distinguished from the elephants of to-day by the long hair which hung in a coarse mane from the neck and along the belly, nearly dragging on the ground. This shaggy envelope of hair must have added greatly to the apparent size and formidable appearance of this giant.

We know less about the appearance of the mastodon than the elephant proper. Their proportions were evidently not more widely different than those of our domesticated bull and the buffalo. The mastodons were probably never over eleven feet high. They had straight tusks, as have our modern elephants, their grinding teeth, which exhibit the most characteristic differences, separating them from their larger relatives, were fitted for the grinding of rougher food. From the extreme frequency of the occurrence of the remains of the mastodon in the swamps of the West, it seems likely that this form of elephant was peculiarly suited to exist in such regions.

There can be no doubt that a few thousand years ago these companion giants roamed through the forests and along the streams of the Mississippi Valley. They fed upon a vegetation not materially different from that now existing there. Replace them in the primeval forests of that region and their wants would be as well supplied as when they were lords of the domain. The fragments of wood which one finds beneath their bones seem to be of the common species of existing trees; even the reeds and other swamp plants which are imbedded with their remains are apparently the same as those which now spring in the soil. The naturalist, accustomed as he is to behold the mysterious changes of life, where races sink at once into a common grave, and the face of earth prepared for other actors in the great tragedy of existence, cannot but feel more keenly than before the temporary character of all life when he opens to the light of day the resting place of one of those species of gigantic animals. What could have been the nature of these agents

which at one stroke drove from the face of earth two of the most powerful races of its inhabitants, sweeping with them many smaller forms, such as the extinct deer and bulls which we find buried with them. The unchanged geography of the country assures us that no great convulsion of nature brought it about. The similarity of the vegetation of the elephant period, with that now growing on the same soil, shows pretty conclusively that it was not due to great geographical changes of other regions reacting on the climate of the region they inhabited. It is not meant to assert that no changes of climate have taken place; on the contrary, such changes have most likely come about; but they have hardly been sufficient to extinguish animals so well adapted as the *Elephas primigenius* undoubtedly was to brave climatic irregularities.* There seems but one other way to explain the extirpation of these races and that is through the action of man. There is no longer any doubt that our ancestors of the stone age, on the European continent, were ushered on to earth in the midst of the gigantic animals of the elephant period. It is now over thirty years since Schmerling of Liege presented the evidence of the contemporaneity of the remains of man with those of the cave bear and other extinct animals. Step by step the evidence has accumulated, overwhelming the determined opposition of those who think that the truth they have is necessarily damaged by all new discoveries. It is impossible to present here the evidence which supports what may seem to many a too confident assertion; its character is known to most readers. Bones of these extinct animals, split for marrow and worked for tools, are probably the most important part of the evidence. But the most unquestionable bit of proof is that which is furnished by a fragment of a tusk of an elephant in the collec-

*So far from a change from warmth to cold having been the cause of the extinction of the fossil elephants which have recently disappeared from the Mississippi Valley, all the evidence would warrant the conclusion that if change of climate was the agent at all, it likely acted by an alteration from cold to warmth, giving a climate too hot for a creature probably clothed as we know the Lena elephant to have been.

tion of M. Lartet, of Paris. Some artistic spirit of the stone age has commemorated an incident of the chase by graving upon this fragment a rude, but spirited representation of the animal to whom the tusk belonged. The form is very characteristic; the shape of head, such as the species is known to have had, differing considerably from that of the African elephant, is clearly shown. But one feature alone is sufficient to show that the savage meant to represent a member of the race to which the Lena elephant belonged; it is the long, shaggy hair, falling like a mane from the shoulders and neck and fringing the belly; this is clearly indicated in the engraving. But for the preservation of the Siberian elephants in ice we would have failed to perceive the meaning of this feature in the drawing; as it is it leaves no doubt that he who drew it had an *Elephas primigenius* in his mind's eye.

It was probably for the best that man should have come upon earth while these giants still lived. They were his teachers in the first arts of craft and courage. Having to dispute the possession of his primitive home, the caverns, with the gigantic cave bear, and the mastery of the forests with the formidable elephants, he was compelled to contrive weapons and use them with well concerted bravery. The magnitude of the dangers which surrounded him compelled him to associate himself with his fellow men, and his triumphs in struggles, where skill and valor prevailed against animal strength, gave him the first rude education of the combat.

If we must seek a reason for the death of the elephants in external influences we may well find it in the coming of man, though it would be quite as reasonable to suppose that their race already, as we have seen very ancient, passed away because it had lived its time and done its appointed work. We have no such evidence of the contact of man with this ancient race of giants on the continent of North America as European discoveries have afforded. No one who has ex-

amined the conditions of entombment of the extinct peoples of the Western states, the preservations of their remains, and the changes which have taken place since their deposition, can believe that the disappearance of the elephants, and the coming of the North American man were separated by any great length of time. When the fields of the West, rich in the remains of these ancient animals and ancient men, are studied as they will be by the rising generation of investigators of that region, the precise relation will be easily established. It is not likely that it will be found that the highly organized mound building nations were instrumental in driving the extinct elephants from the soil of North America. Had they come in contact with these large creatures we should have had some representation of them in their pottery sculpture, where we find figures of all the common large mammals of the West, except as before remarked, the bison, as well as other forms like the manatee which could not have been personally known to the inhabitants of the Ohio Valley. It is more likely to have been some rude dweller in caves of the stone age who slew the last mammoth of America.

The history of the changes in the elephant life, a little while ago so abundant, on three at least of the five continents, is not unlike what we find among other types of animals and plants which have passed the full meridian of their existence and are hastening to their setting. While the type is in its full vigor it spreads its diversified species far and wide over northern as well as southern lands; when it begins to wane the northern species fall first in the struggle, and the last remnants of the type are found beneath the torrid sun where easier conditions permit them to protract a senile life. Among the plants the palm and tree ferns; among the animals the large reptiles like the crocodiles and alligators, the rhinoceros, the hippotamus, the tapirs, the monkeys, and many other types find in the tropical forests the conditions of existence which the ruder climes of the north long since

denied them. Our speculative friend asks, "may it not be that man, driven from the northern lands by the coming of his higher successor on the stage of life, is to finally end his race on earth within the recesses of the gloomy forests of Brazil or Borneo?"

THE MOLLUSKS OF OUR CELLARS.

BY W. G. BINNEY.

Most of the readers of the Naturalist, who reside in the cities of our Atlantic coast, are aware that the cellars of their houses are infested with slugs and snails. They have seen or heard of the glistening tracks made by their slime, and have heard dreadful stories of the ugly creatures who left them when escaping from their nocturnal depredations. But as few of our readers have met them face to face, we propose giving a short description of each with a portrait of sufficient accuracy to enable any one to identify the separate species.

A word first about their characters and habits. They all belong to the great division of mollusks which are called *Pulmonata*, from the fact of their breathing with lung-like vessels. Furthermore, they all belong to that group of *Pulmonata* which are called *Geophila*, or lovers of dry land, from the fact of their habits being terrestrial in distinction from those which are adapted to living in fresh-water, or in the sea. These *Geophila* are distinguished in addition to their breathing with lung-like vessels by their having their eyes at the end of long, slender, cylindrical feelers. Thus far most authors agree, but in subdividing these *Geophila* into natural groups there is so little accord among naturalists that we do not carry our readers farther in classification. Suffice it to say that literally from head to tail almost every

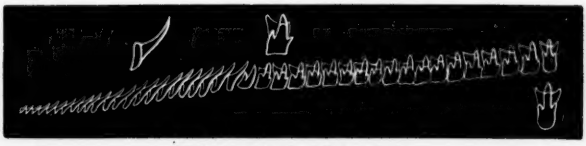
character has been seized to found families upon, and thus far the conchological world is but little the wiser for it.

Our cellar mollusks are all nocturnal in their habits. They lie quietly stowed away in some crack or crevice of the walls during the day. At night they sally forth in pursuit of food and to enjoy the company of their kind. They feed on vegetable matter—refuse from the kitchen, decaying vegetables or fruits—or on Indian meal, flour, or anything they are lucky enough to find. They even devour animal food, and in confinement have even been accused of cannabalism. When one comes to know how well adapted their mouth is to eating, it becomes a wonder that our mollusks leave anything uneaten. For the mouth of each individual mollusk is

Fig. 42.

Jaw of *Limax flavus.*

Fig. 43.



Half row of teeth of *Limax flavus.*

armed at its entrance with a sharp, stout, pointed process, called a jaw, for want of a better term. This falls, portcullis-like, on the food of the animal, and cuts off pieces into his mouth. We give here a figure of the jaw of *Limax flavus* one of the species mentioned below (Fig. 42). Once in the mouth the food is taken hold of by a long, broad, ribbon-like membrane, generally called a tongue. The whole surface of this tongue is covered with sharp, tooth-like processes running in transverse rows. These small, sharp teeth rasp quickly the food and carry it forwards towards the stomach. Short work they must make of it, for the number of these tooth-like processes is very great, counting as high as eighty thousand in some species. We give here a figure of one-half of one transverse row of teeth on the tongue of the same species whose so-called jaw is already figured (Fig. 43). To

understand the figure it must be borne in mind that the remaining half of this transverse row is similar to the half figured, and that all the transverse rows are alike. Thus our figure gives as good an idea of the tongue as if the whole hundred rows of eighty-five teeth each were given. No wonder the possessors of all these teeth have a reputation for voracity and that their presence is dreaded in kitchen gardens.

Our cellar mollusks are active all the year round, owing to the milder and more equal climate of their abode. They do not hibernate like their brethren of the fields and woods. Their soft shell-less body gives them little protection from their enemies. Like all animals so defenceless they would soon become exterminated had they not great powers of reproduction. They lay eggs several times during the year, and in such numbers that a couple of them will lay as many as six hundred in a year. These eggs are gelatinous, semitransparent and globular, sometimes attached together like a rosary. They are remarkably tenacious of vitality, so much so that they resist the greatest extremes of temperature. They have even been shrunk and dried in a furnace and kept for years in this state, yet still have developed their young upon being restored to moisture. The young animal emerges from the egg in about a month, and when two months old begins to reproduce its kind, though not itself arrived at more than half its greatest size.

Only one species of our cellar mollusks is furnished with an external well developed shell. The others are what are commonly known as *slugs*. They have, however, under the skin of the forepart of their body, called the mantle, a rudimentary shell, either in grains of calcareous matter or in a regular calcareous plate. This plate was formerly supposed to have great medicinal properties, and has been said to be a sovereign remedy for almost all the ills that flesh is heir to.

The whole surface of their body is constantly lubricated by a watery fluid. They also have the power of secreting a

milk-like mucus at any part of their body which may require protection from any foreign substance. This secretion of mucus is their only means of defence against their enemies. It also is used as a thread like the spider's web to enable them to descend to the earth.

All the species mentioned below are of foreign origin. They were imported from England. They are found only in close proximity to man around his habitation, either in cellars or gardens. Most of them were noticed more than half a century ago, as early as mollusks became to be studied in our country. They have also been imported into other colonies of England, and probably are destined to become the most cosmopolitan of mollusks.

Fig. 44.

Shell of *Hyalina cellaria.*

We will now describe the various species found in our cellars, commencing with the only one which bears a well developed external shell (Fig. 44). This is the *Hyalina cellaria*, a thin, horn colored, glistening, flattened shell of five whorls, and less than half an inch in diameter. The edge of the aperture is sharp, not reflected, or thickened by a border of testaceous matter. It is a common European shell of which a single specimen was first noticed by a gentleman in Philadelphia on a wharf near the foreign shipping. It was shown to Mr. Say, who described it as a new species. Of late years it has not been seen in that city, but from Astoria, Long Island, to Halifax, it exists in almost every Atlantic port. It is found only in cellars and gardens. It used to be very common under the bricks of the inner edge of the sidewalk on the north side of Mount Vernon street, Boston, between Walnut street and Louisberg Square.

Fig. 44a.

Animal of *Hyalina cellaria.*

Limax maximus is the largest of our cellar slugs (Fig. 45). It seems to be a more recent importation than the other species, having first been noticed in Philadelphia in 1867. It appeared almost simultaneously at Brooklyn, New York, and

at Newport, R. I. The individual figured was found in a garden in Pelham street of the last named city. Some indi-

Fig. 45.

Limax maximus.

viduals placed in a garden in Burlington, New Jersey, were shortly after found in an adjoining cellar. This species is readily distinguished by the rich brown or black stripes running lengthwise down its back, giving it a leopard-like appearance. It is about four inches long.

Fig. 46.

Limax flavus.

Limax flavus, whose tongue and jaw are figured above, grows about three inches long (Fig. 46). It is characterized by a brownish color, with oblong-oval uncolored spots; body cylindrical, elongated, terminating in a short prominent keel; mantle oval, rounded at both ends, with rounded spots; base of foot sallow white. It has been noticed for more than forty years in the cities of our Atlantic coast, and probably has followed the white man over the whole country.

Fig. 47.

Arion fuscus.

Arion fuscus belongs to a different genus from the last named slugs (Fig. 47). .It is readily distinguished by its

jaw which has no median beak-like projection to its cutting edge, but has rib-like processes on its anterior face, crenulating the margin. Its tongue differs also in the form of the teeth. In the forepart of its body, under the rounded shield-like process of the skin, there are calcareous grains instead of a well formed plate. And finally at its tail is a decided triangular perpendicular mucus pore. It grows about one inch long. The color is whitish, grayish or brownish; upper surface marked with elongated crowded glands; mantle oval, granulated; tail obtuse, not carinated; the sides marked with an obscure brownish line. It is of European origin and thus far has only been noticed in Boston and vicinity. It is not properly a cellar snail, but is found with the preceding species around kitchens and gardens.

REVIEWS.

CHALCHIHUITLS.* — [Mr. Squier has in this communication to the Lyceum given a very important and interesting summary of what is known relating to the carved "green stones" from Mexico and Central America, and as he has kindly placed the original cuts of the article in our hands, we make this review in the form of extracts from his communication. In a future number we shall give figures of a few similar carved stones collected by Mr. McNiel in Nicaragua.]

"Among the articles of ornament used by the aboriginal inhabitants of Mexico and Central America, those worked from some variety of green stone resembling emerald, and called by the Nahuatl or Mexican name *chalchiuitl*, *chalchihuitl*, or *chalchiuite*,†. were most highly esteemed, and are oftenest mentioned by the early explorers and chroniclers. The word *chalchiuitl* is defined by Molina, in his *Vocabulario Mexicano* (1571), to signify *esmeralda baja*, or an inferior kind of emerald. The precious emerald, or emerald proper, was called *quetzalitztli*, from the *quetzal*, the bird known to science as the *Trogon resplendens* (the splendid plumes of which, of brilliant metallic green were worn by the kings of Mexico and

* Observations on a Collection of Chalchihuitls from Mexico and Central America. By E. G. Squier. From the Annals of the Lyceum of Natural History of New York. 1869.

† I have followed the orthography of the word throughout, as given by the various authors quoted.

Central America as regal insignia), and *itzli*, stone; *i.e.* the stone of the *quetzal*.

Sahagun mentions four of the Mexican gods who were the especial patrons of the lapidaries, and honored as the inventors of the art 'of working stones and *chalchiuites*, and of drilling and polishing them.' He does not, however, describe the process made use of by the Indians in cutting precious stones, 'because,' he says, 'it is so common and well understood;' an omission which his editor, Bustamente, regrets, 'since the art is now entirely lost.'

Quetzalcoatl, the lawgiver, high-priest, and instructor of the Mexicans in the arts, is said to have taught not only the working of metals, but 'particularly the art of cutting precious stones, such as *chalchiuites*, which are green stones, much esteemed, and of great value.' (*Torquemada*, lib. vi., cap. xxiv.) Quetzalcoatl himself, according to certain traditions, was begotten by one of these stones, which the goddess *Chimalma* had placed in her bosom. Indeed, both among the Mexicans and the nations farther to the southward, the *chalchihuitl* seems to have represented everything that was excellent in its kind. Its name was used in compounding designations of distinction and honor, and was applied both to heroes and divinities. The goddess of water bore the name of *Chalchiuitlcuye*, the women of the *chalchiuites;* and the name of *Chalchiuhapan* was often applied to the city of Tlaxcalla, from a beautiful fountain of water near it, the color of which, according to Torquemada, 'was between blue and green.' Cortez, according to the same authority, was often called '*Chalchiuitl*, which is the same as captain of great valor, because *chalchiuitl* is the color of emerald, and the emeralds are held in high estimation among the nations.' (*Monarchia Indiana*, vol. i, p. 435.) When a great dignitary died his corpse was richly decorated for burial with gold and plumes of feathers, and 'they put in his mouth a fine stone resembling emerald, which they call *chalchihuitl*, and which, they say, they place as a heart.' (*Ib.*, vol. ii. p. 521.)

Fig. 48.

Human Skull, Ancient Mexican, inlaid with turquoise and obsidian.

Sahagun, in one place describes the *chalchihuitl* as 'a *jasper* of very green color, or a common emerald.' Elsewhere he goes into a very full description of the various kinds of green stones which the Mexicans held in esteem, and as his account may materially aid in identifying the *chalchihuitl*, it is subjoined entire:

'The emerald which the Mexicans call *quetzalitztli* is precious, of great value, and is so called, because by the word *quetzalli* they mean to say a very green plume, and by *itztli*, flint. It is smooth, without spot; and these peculiarities belong to the good emerald; namely, it is deep green with a polished surface, without stain, transparent, and at the same time lustrous. There is another kind of stone which is called *quetzalchalchivitl*, so called because it is very green and resembles the *chalchivitl;* the best of these are of deep green, transparent, and without spot; those which are of inferior quality have veins and spots intermingled. The Mexicans work these stones into various shapes; some are round and pierced, others long, cylindrical, and pierced; others triangular, hexagonal or square. There are still other stones called *chalchivites*, which are green (but not transparent), mixed with white; they are much used by the chiefs, who wear them fastened to their wrists by cords, as a sign of rank. The lower orders (*maceguales*) are not allowed to wear them. . . . There is yet another stone called *tlilaiotic*, a kind of *chalchuite*, in color black and green mixed. . . . And among the jaspers is a variety in color white mixed with green, and for this reason called *iztacchalchiuitl*.* Another variety has veins of clear

Fig. 49.

Chalchihuitl, or engraved precious stone, from Ocosingo, Central America. Full size.

* *Iztac* signifies white; i. e. *white chalchihuitl.*

green or blue, with other colors interspersed with the white. . . . And there is yet another kind of green stone which resembles the *chalchiuities*, and called *xoxouhquitecpatl*.* It is known to the lapidaries as *tecelic*, for the reason that it is very easy to work, and has spots of clear blue. The wrought and curious stones which the natives wear attached to their wrists, whether of crystal or other precious stones, they call *chopilotl*—a designation that is given to any stone curiously worked or very beautiful.' (*Historia de Nueva España*, lib. xi., cap. viii.) The same author, describing the ornaments which the Mexican lords used in their festivals, speaks of a 'head-dress called *quetzalalpitoai*, consisting of two tassels of rich plumes, set in gold, and worn suspended from the hair at the crown of the head, and hanging down on each side towards the shoulders. They also wear rings of gold around the arms and in their ears, and round their wrists a broad band of black leather, and suspended to this a large bead of *chalchiuitl* or other precious stone. They also wear a chin ornament (*barbote*) of *chalchiuitl* set in gold, fixed in the beard. Some of these *barbotes* are large crystals, with blue feathers put in them, which give them the appearance of sapphires. There are many other varieties of precious stones which they use for *barbotes*. They have their lower lips slit, and wear these ornaments in the openings, where they appear as if coming out of the flesh; and they wear in the same way semilunes of gold. The noses of the great lords are also pierced, and in the openings they wear fine turquoises or other precious stones, one on each side. They wear strings of precious stones around their necks, sustaining a gold medal set round with pearls, and having in its centre a smooth precious stone.' (*Ib.*, lib. viii. cap. ix.)

In these descriptions, it will be seen that the *chalchihuitls* are spoken of as ornaments, round or oblong beads, which conforms with the representations in the paintings. But these or similar green stones were used for other purposes. The chronicler Villagutierre, in his account of the conquest of the Itzaes of Yucatan, speaks of idols in their temples 'of precious jasper, green, red, and of other colors;' and, in describing the great temple of Tayasal, mentions particularly an idol which was found in it, 'a span long, of rough emerald (*esmeralda bruta*), which the infidels called the god of Battles,' and which the conquering general, Ursua, took as part of his share of the spoil.

The Mexicans nevertheless had true emeralds, of which we have left to us the most glowing descriptions. Gomara describes particularly five large ones which Cortez took with him from Mexico to Spain at the time of his first visit, and which were regarded as among the finest in the world. They were valued at 100,000 ducats, and for one of them the Genoese merchants offered 40,000 ducats, with the view of selling it to the Grand Turk. Cortez had also the emerald vases, which the padre Mariana assures us, in the supplement of his History of Spain, were worth 300,000 ducats. They are reported to have been lost at sea. All these emeralds

* From *xoxouhqui*, *cosa verde*, something green, and *tecpatl*, stone; *i. e.* green stone.

were cut in Mexico by Indian lapidaries under the orders of Cortez, and were most elaborately worked. One was wrought in the form of a little bell, with a fine pearl for a clapper, and had on its lip this inscription in Spanish, *Bendito quien te crió!* Blessed he who made thee! The one valued most highly was in the shape of a cup, with a foot of gold. All of them were presented by Cortez to his second wife, who thus, says Gomara, became possessed of finer jewels than any other woman in Spain. Remarkable as were these emeralds, Peter Martyr mentions one, of which Cortez was robbed by the French pirates, that must have surpassed any of them in size and value.

Fig. 50.

Basso-Relievo of the god Cuculcan, from Palenque.

Coming down to later times, we find Professor P. Blake (Amer. Jour. of Sci. and Arts, March, 1858), in an interesting article on 'The Chalchihuitil of the Mexicans,' informing us that the Navajo Indians in the northern and western portions of New Mexico wear small ornaments and trinkets of a hard, green stone, which they call by the Mexican name, and which they regard as of great value; 'a string of fragments large enough for an ear-ring being worth as much as a mule.' Mr. Blake, suspecting this stone to be turquoise, and learning that it was yet procured in small quantity by the Indians among the mountains about twenty miles from Santa Fè, visited the spot, where he found an immense pit excavated in granular porphyry, '200 feet in depth and 300 or more in width,' besides some smaller excavations. He obtained many fragments of the so-called *chalchihuitil* 'of applegreen and peagreen, passing into bluish-green, capable of a fine polish, and of a hardness

little less than that of feldspar.' The fragments found were small, not exceeding three-quarters of an inch in length and one-quarter of an inch in thickness, and the material 'appeared to have formed crusts upon the surfaces of cavities or fissures in the rock, or to have extended through it in veins.'

Mr. Blake's description applies to the specimens exhibited to the Lyceum not long ago by Professor Newberry, and there is no doubt that the material was, or rather is, a variety of the turquoise. But I doubt if it be the true *chalchihuitl* of the Mexicans and Central Americans. That they used the stone described by Mr. Blake for certain purposes, I know;

Fig. 51.

Chalchihuitl from Ocosingo. Two-thirds actual size.

for there exists in the museum of the late Mr. Henry Christy, in London, a human skull completely encrusted with a mosaic of precisely this stone, and a flint knife with its handle elaborately inlaid with it, in small fragments. Of the first of these relics I present a drawing made by Waldeck and published by the French Government. See FIG. 48.*

The weight of evidence, in my opinion, goes to show that the stone properly called *chalchihuitl* is that which Molina defines to be '*baja esmeralda*,' or possibly nephrite, 'a jasper of very green color,' as Sahagun, already quoted, avers. I should therefore object, on strictly critical and historical grounds, to the suggestion of Mr. Blake, that the variety of turquoise found by him should be 'known among mineralogists as *chalchihuitl*.'

But apart from any speculations on the subject, I have to lay before the Lyceum a most interesting series of green stones, unrivalled, in their

* In Mr. Christy's Museum is also a wooden mask encrusted in like manner, with turquoises, malachite, and white and red shells. The predominant stone in all is the turquoise. The back of the skull in the specimen engraved is cut away, so as to admit the face to be hung by leathern thongs (which still remain) over the face of an idol, as was the custom in Mexico. The transverse black bands in the cut are of obsidian in the original. The eyeballs are nodules of iron pyrites, cut hemispherically and highly polished.

way, in the world, which were found among the ruins of Ocosingo, in the department of Quesaltenango, Guatemala, on the borders of Chiapas, and not remote from the more famous but hardly less imposing monuments of Palenque. I must not omit to say that, in common with similar stones, they were designated by the people of the region where they were found as *chalchichuites*.

FIG. 49.—The first and most interesting of these is precisely four inches long by two and three-tenths broad, and about half an inch in average thickness. The face is sculptured in low relief, with the figure of a divinity seated, cross-legged, on a kind of carved seat, with his left hand resting on his thigh, and his right raised to his breast, as if in the act of giving benediction. Around his loins is an ornamental girdle, and depending from his neck and resting on his breast is an oblong rectangular plate or charm, not unlike that said to have been worn by the Jewish high-priests. The face is in profile, showing the salient nose and conventional receding forehead that characterize most Central American sculptures. Ornaments are inserted in the lobes of the ears, and the head is surmounted with the characteristic and elaborate plumed head-dress that we observe on the Palenque monuments and in the paintings. The whole is almost an exact miniature copy of the large *bas-relief* found by Mr. Stephens in an inner chamber of one of the ruined structures of Palenque (FIG. 50). At about one-third of the length of the carved chalchihuitl, measuring from the top, it is drilled through from edge to edge, the hole being a little less than two-tenths of an inch in diameter; the drilling having been made from each side to the centre, where the two drillings run one into the other, with a slightly diminished bore. The purpose of this seems to have been to suspend the object from the neck or other part of the person; but the back edges of the plate are also pierced diagonally, as if to afford means of fastening it to cloth or other material, without those means showing in front.

Fig. 52.

Chalchihuitl from Ocosingo. Two-thirds actual size.

FIG. 51.—The next relic in importance is of a similar but more opaque material, which, were it not for a strip of clear quartz on one edge, might be mistaken for enamel. It is a semi-disk in shape, four and a half inches in length by two and seven-tenths in greatest width. It shows a human face in full front, surmounted by a kind of heraldic shield, and surrounded by a profusion of feather ornaments, with huge earrings and other ornaments below the chin. It, too, is pierced near its upper edge, longitudinally from side to side. The back shows that it was sawn from a solid block of the same material, both from above and below, until the cuttings reached each other within half an inch, when the intermediate core, if I may so call it, was broken off. The *sierre* of the saw is distinctly visible from the top as well as the bottom, although the *strie* are nearly polished out. This was clearly intended to be suspended, as there are no means by which to fasten it to robes of any kind. It must have served as a gorget or breast-plate.

FIG. 52.—This is a most interesting, although a very irregular, and comparatively rude specimen, four inches and two-tenths long by two and a half inches wide at its widest part. The back shows a compact greenish stone, with the same evidences of having been sawn from a solid block to which I have alluded in describing FIG. 51. The front appears as if of a brilliant green enamel, exhibiting a full human face with a large and elaborate feather helmet or crown, huge ear and neck ornaments impossible to describe, and only to be understood by inspection of the original. This, too, is pierced, like that last described, from edge to edge, near its upper end.

FIG. 53.—This is a comparatively small fragment of identical material with FIG. 49, an irreg-

ular triangle in shape, somewhat concave on the face, where is carved in profile a human head, surmounted also with elaborate plumes, but with eyes closed as if in death. This is drilled through vertically and horizontally, and there are small diagonal holes, designed to afford means of attachment by threads to some portion of the dress of the wearer. It is polished back and face, and measures two and three-tenths inches by one and nine-tenths. It has its almost exact counterpart in the Christy, formerly Mayer, Museum, of London.

FIG. 54.—This specimen is peculiar and very interesting. It is a slightly irregular globe, two and six-tenths inches in diameter, pierced from top to bottom by a perfectly circular hole one and three-tenths of an inch in diameter. On three sides, if I may use the expression in respect of a sphere, are as many engraved hieroglyphics, using that term in the popular sense, but which I conceive to be syllabo-phonetic or phono-syllabic signs, of which, of course, only engravings can give any adequate notion. (FIGS. 55, 56, 57.) As I shall have something to say about this specimen farther on, I proceed to notice a simple polished perfect globe, of the same material with that last alluded to, and which may be sufficiently described as a large bead, an inch and a tenth in diameter, pierced through its exact centre by a hole sufficiently large to admit a stout thread.

Fig. 53.

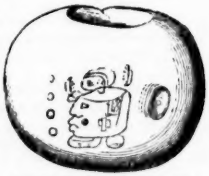
Chalchihuitl from Ocosingo. Full size.

FIGS. 58 and 59 are types of a large class of what may be called chalchihuitl ornaments, with no special significance.

FIGS. 60 and 61, however, may have a hieroglyphical significance. The latter (FIG. 61) is a fragment of a thin plate, of the same stone with the objects already described, two inches and eight-tenths in length by two inches and three-tenths broad and two-tenths of an inch thick, engraved on both surfaces and cut through with ornamental devices.

FIG. 62 is an engraving of one of a number of hat-shaped objects of the stone under notice, pierced through, so as to leave a very thin rim and walls, and obviously designed to hold those *penachos* or clusters of feathers which the Spanish conquerors so often describe, and which are so conspicuous in the head ornaments represented on the monuments and in the aboriginal paintings of Mexico, Central America, and Peru. They are each two inches and two-tenths in diameter over the rim, one inch and one-tenth high, with a bore of eight-tenths of an inch in diameter.

Fig. 54.



Chalchihuitl globe, pierced. One-fourth size.

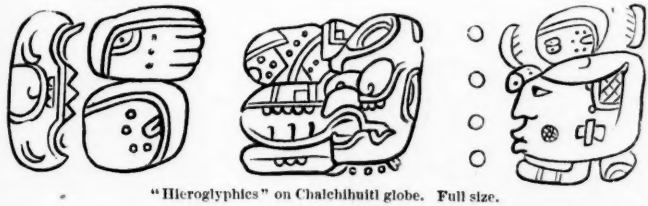
The relics above described are fair types of the chalchihuitls found at Ocosingo; but I possess some other worked and engraved greenstones, worth mentioning, perhaps, in this connection. The first of these,

FIG. 63, has some resemblance to the engraved Assyrian seals, or, as they are sometimes called, 'Chaldean' cylinders. It is a perforated cylindrical piece of heavy, opaque stone, of a dark sea-green color (nephrite?), two inches long by an inch and one-tenth in diameter. In a kind of oval or what Egyptian scholars would call a *cartouche*, is presented the profile of some divinity (the Maya God of Death?), with the eye closed and the tongue depending from the corner of the mouth. Something like claws, engraved on a projection of the cylinder, start out from the *cartouche* on the left side. The whole is boldly and sharply cut, and highly polished. This relic was obtained from the island of Flores, the ancient Tayasal, in the lake of Itza or Peten, in Yucatan. Among the things found by the conqueror of the Itzaes, Ursua, in the

temples which he destroyed in the island in 1697, he mentions 'an idol of emerald a span long, which,' says the chronicler, 'he appropriated to himself.'

It may be observed of the figure engraved on this stone, that *to speak*, among American nations, was the verbal as well as the symbolical expression of life or being, as is *to see* or *to*

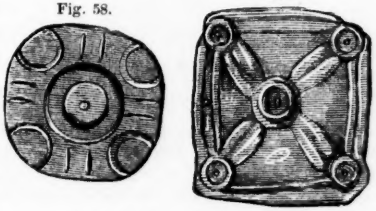
Fig. 55. Fig. 56. Fig. 57.



"Hieroglyphics" on Chalchihuitl globe. Full size.

breathe, or *to eat*, among other nations in various parts of the world. The projecting tongue in the sculptured and painted American idols and figures denotes the living God or man; he who can talk, and therefore lives. In this instance, the lax and drooping tongue heightens the idea of death which the closed eye in part conveys.

Fig. 58. Fig. 59.



Chalchihuitl ornaments. Half size.

FIG. 64 is an engraving of a stone hatchet or adze of hard green stone, resembling quartz, five inches long. It is highly polished on the face, but the reverse has marks which show that it too was sawn from a block of the same material. Where the notches occur in the sides there are holes drilled entirely through the stone, parallel with its face. The lower or cutting edge is slightly curved outward, implying that, if intended for practical service, it was an adze. But it is to be presumed that it was worn symbolically, in the

Fig. 60. Fig. 61. Fig. 62.

Chalchihuitl engraved plates.

way of distinction or ornament. It was found in an ancient grave in Costa Rica. The ruling Inca of Peru carried an axe instead of a sceptre as one of his insignia of dominion.*

* In Greece stone weapons of jade or nephrite are sometimes found, which the common people call 'thunderbolts,' and hold in high estimation. A correspondent of the 'London Athenæum' found a similar object, called by the same name, in Nassau, New Providence, in the Bahamas. He describes it as polished and flattened, pointed at one end, with a broad cutting edge at the other, and regarded by the natives as a preventive against lightning. Another correspondent of the same publication states that he found a similar object in Jamaica forty years ago, also called a thunderbolt. It was kept in an earthern jar filled with water, and was supposed to keep the water cool.

FIG. 65 (full size of original) is the easily recognizable figure of a frog, in a kind of malachite from the island of Omotepec, Lake Nicaragua.

FIG. 66 is of still another and harder variety of green stone, from a mound near Natchez,

Fig. 63.

Engraved stone cylinder from Yucatan.

Fig. 64.

Hatchet of green stone from Costa Rica.

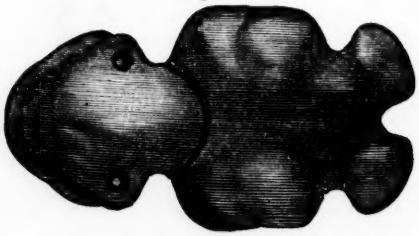
and appears to be a strange combination of the head of a siren of our western waters, or of the frog, with the human body. It is also pierced laterally, like those already described, doubtless for suspension.

I do not present FIGS. 63, 64, 65, and 66 as specimens of the *chalchihuitl*, but as showing the regard paid to green stones generally. It is one that pervades both continents and many nations, from the advanced Chinese,

Fig. 65.

Sculptured frog, Nicaragua.

Fig. 66.



Carved green stone found near Natchez.

to whom the green jade is sacred, to the savage dwellers on the banks of the Orinoco, among whom Humboldt found cylinders of hard green stones, the most highly prized objects of the several tribes, and some of which it must have required a lifetime to work into shape.

Of the carved chalchihuitls, like those described from FIG. 48 to FIG. 62, I have seen but three specimens outside of my own collection: one already alluded to in the Christy Museum of London, another in the late Uhde Museum near Heidelberg, and a third in the Waldeck collection in Paris.

The question how these obdurate stones were engraved, drilled, and sawn apart, or from the blocks of which they once formed a portion, is one likely to arise in most minds. It is one that has puzzled many inquirers; nor do I pretend to give an answer, except that the drilling was probably performed by a vibratory drill, composed of a thin shaft of cane or bamboo, the silica of which was reënforced by very fine sand, or the dust of the very article under treatment. The *striæ* shown in the orifices are proof of something of the kind, and the esteem attached to these stones by the aborigines proves that their value, like that of the mainspring of a watch, was due mainly to the amount of labor expended in their production.

As regards the sawing, of which the backs of FIGS. 51, 52, and 64, afford striking examples, we may find a clue in the accounts of the early chroniclers, who relate that they saw, in Santo Domingo and elsewhere, the natives use a thread of the *cabuya* (or agave), with a little sand, not only in cutting stone, but iron itself. The thread was held in both hands, and drawn right and left until worn out by attrition, and then changed for a new one, fine sand and water being constantly supplied.

Not a few inquirers entertain the hypothesis that most of the raised and sunken figures on various stones in Mexico, Central America, and the mounds of the United States, were produced by persistent rubbing or abrasion — a general hypothesis which I shall not dispute. But in objects from the mounds, as well as from other points on the continent, we have distinct evidence of the use of graving or incisive tools of some kind — as for instance in the hieroglyphics in FIG. 54, which are cut in a stone so hard that the blade of a knife produces scarcely any impression on its polished surface.

THE RECORD OF ZOOLOGICAL LITERATURE FOR 1868.* — We have before alluded to the great and increasing value of this work, and again urge its importance to American naturalists situated as many of them are away from libraries. We cannot understand how any entomologist can do without the part on insects; or the conchologist without that on shells; or the ornithologist be at all informed on the progress of his speciality unless he has this work to refer to. Its preparation is a labor of love by the editors and its liberal minded publisher, Mr. Van Voorst; and the work is a credit to their heads and hearts.

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*Vol. V. Edited by Dr. A. Gunther. London. Van Voorst, 1869. 8vo, pp. 592. Price reduced to $10 a vol. The Record for 1867 and 1868, also in parts: Part 1, *Vertebrates*, $3.50; Part 2, *Entomology*, $4.00; Part 3, *Molluska*, *Crustacea* and the *Lower Animals*, $3.50. For sale at the Naturalist's Book Agency.

THE RECORD OF AMERICAN ENTOMOLOGY FOR 1869 will be published late in May. It will contain chapters by Messrs. Scudder and Uhler, Drs. Horn and Packard, and Baron Osten Sacken. Price, $1.00, which does not cover the cost of printing. We trust lovers of entomology will evince their zeal for the science by promptly subscribing to this useful publication. We hope that it will meet with better support than last year, as the publishers are sadly out of pocket in consequence of the small sale of the work for 1868.

THE WEEDS OF MAINE.* — This pamphlet, issued from the State Printing Office, consists of a few forms taken from the recent report of the Secretary of the Maine Board of Agriculture. The young man whose name appears as the author, has certainly shown a remarkable taste for botanical study. Wholly unassisted, even by friendly advice, he commenced the study of botany under great disadvantages and he has zealously prosecuted his herborizing during the too scanty leisure afforded by a Maine farm. The extraordinary power of diagnosis, which the author possesses, leads us to hope that he will devote the next few years to rigid disciplinary study, and then resume botanical work for which he seems to be so well fitted. The pamphlet itself is not to be criticised as a botanical work, and therefore we shall take the present opportunity to make it the text for a few very brief remarks. It is so easy to learn the names of plants and associate the two together, and so very difficult to learn *the plant itself*, that too many of our young botanical students are devoting their time simply to collecting, preserving, and naming specimens. In view of the many great questions in plant-physiology which are now being asked, it seems to be a sort of botanical dissipation to give up to the name what is due to the plant. These questions arise every week. The January 3d number of "Comptes rendus," contains a very interesting note by M. Prillieux upon the movements of chlorophyl grains under the influence of light. It is obvious that such a subject of study as this, one dealing with forces and with life itself, is more difficult than that of guessing at the names of all the Solidagos and half the Carices, but it is plain, too, that the thinkers of our time are asking that the former kind of work shall be done and faithfully done. Our plants are well named, and therefore we are justified in suggesting that our young botanical friends devote less time to mere "botanizing," as it is absurdly called, and give more time and better work to the study of *the plant*.

THE GEOLOGY OF THE NEW HAVEN REGION.† — Professor Dana describes the geology of New Haven and vicinity, with especial reference to the origin of its topographical features; showing by special facts, that the region, in the glacial era, like that of New England to the North, was moulded by ice, and that icebergs had no part in the matter, and the supposed iceberg sea over New England no existence.

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* By F. L. Scribner.

† From the Transactions of the Connecticut Academy. 1870. 8vo, pp. 112.

NATURAL HISTORY MISCELLANY.

BOTANY.

COLLECTED NOTES ON THE HISTORY OF THE AMERICAN OAKS. — The first American oak noticed in botanical works is the white oak, mentioned by Parkinson in "Theatrum Botanicum," 1640, as *Quercus alba Virginiana*. Banister, 1686, in "Catalogus Plantarum in Virginia Observatarum" (in Rayi Historia) mentions *Quercus alba virens* (as *Virginiana semperviren*s), *Phellos* (as *Ilex Marilandica*) with a drawing by Ray, and *ilicifolia* Wg. (as *Q. pumila*).

Pluckenet in "Amagestum Botanicum," 1696, enumerates *Quercus esculi divisura*, which is *Q. rubra* L., *Q. Americana rubris venis* (*Q. coccinea* Wg.), var. γ (DC.), *Q. Virginiana salicis longiore folio* (*Q. Phellos* L.), *Q. Virginiana semperviren*s (*Q. virens* Ait.), *Q. castaneæ folio* (*Q. prinus palustris* Michx.), *Q. pumila castaneæ folio Virginiensis* (*Q. prinus pumila* Michx.), *Q. rubra*, *Phellos* and *Prinus palustris*, are illustrated.

Catesby in his "Natural History of Carolina," 1731, names *Q. alba*, *Prinus palustris* and *virens*. *Q. nigra* L., he calls *Q. Marilandica*; *Q. aquatica* Walt., he knows under the name *Quercus folio non serrato*; his *Q. esculi divisura* is *Q. Catesbæi* Michx.. and his *Q. humilis salicis folio breviore* is *Q. cinerea* Michx.; all except the latter are illustrated.

Charlevoix in "Histoire et description générale de la Nouvelle France," Paris, 1744, knows *Q. prinus palustris* Michx., *Q. alba* L., *Q. virens* Ait., and *Q. nigra* L.; he gives drawings of the three latter.

In Gronovius' "Flora Virginica," 1743, containing the plants which John Clayton observed in Virginia, we find *Q. Phellos*, *nigra*, *aquatica*, *Prinus palustris*, *ilicifolia*, which he calls *Q. pumila bipedalis*, *Q. stellata* Wg. (to him *Q. alba*) and *falcata* Michx., which he calls *rubra seu hispanica*.

Kalm in his travels, or rather in his "Preliminary Report on his Botanical Collections," 1751, mentions only four oaks. *Q. rubra* and *alba*, the Spanish oak (*Q. falcata* Michx.) and another one with three lobes at the apex of the leaves, which is perhaps the var. *triloba* of the latter (*Q. triloba* Michx.). These are the American oaks known at the time when Linnæus' "Species Plantarum," 1753, was published. Linné established five species, *Q. Phellos*, comprising *Q. virens* and *cinerea* as varieties β and γ. *Q. nigra* *x* and β (*x* being *aquatica* Walt.), *Q. rubra*, comprising *rubra*, *coccinea* and *Catesbæi*, *Q. prinus* (*Q. prinus palustris* Michx.) and *Q. alba*.

Du Roi published (in "Harbke'she wilde Baumzucht," Braunschweig, 1771) a new species, *Q. palustris*.

Marshall published his "Arbustum Americanum," in 1785, in which he described the following oaks: *Q. alba*, *Q. alba minor=stellata* Wg., *Q. alba palustris*, which is apparently *Q. Prinus tomentosa* Michx., not *Q.*

alba. as Michaux says; *Q. nigra=coccinea* (*Q. tinctoria* Bartr.), *Q. nigra digitata*, *Q. nigra trifida*, *Q. nigra integrifolia*, the two latter certainly falling under *Q. nigra* L. var. *β*. *Q. nigra pumila=Q. ilicifolia* Wg., *Q. rubra; Q. rubra ramosissima=Q. palustris* Du Roi; *Q. rubra montana=Q. falcata* Michx.; *Q. rubra nana=Q. Catesbæi* Michx.; *Q. Phellos angustifolia* and *latifolia=Q. Phellos* L. (*silvatica* Michx.); *Q. Phellos sempervirens=Q. virens* Ait.; *Q. Prinus=Q. Prinus monticola* Michx.; *Q. Prinus humilis= Q Prinus pumila* Michx.

Wangenheim in his work on the "Americanische Holzarten," 1787, proposed some new species, of which three are acknowledged to-day: *Q. stellata* (the *Q. alba minor* of Marshall), *Q. ilicifolia* (the *Q. pumila* of Banister), and *Q. coccinea* (*Q. rubra* L., var. *a*). His *Q. cuneata* is *Q. falcata* Michx., var. *γ triloba*, and his *Q. uliginosa* is the *Q. aquatica* Catesby.

Walter in "Flora Caroliniana," published in the year 1788, enumerated thirteen oaks: 1, *Q. sempervirens* (*virens* Ait.); 2, *Q. Phellos;* 3, *Q. humilis* (*cinerea* Michx., var. *γ. humilis*); 4, *Q. pumila* (*cinerea* Michx., var. *pumila*); 5, *Q. Prinus;* 6, *Q. nigra;* 7, *Q. aquatica* (*nigra* L., *a*); 8, *Q. rubra* (*glandibus parvis globosis*, perhaps *Q. ilicifolia* Wang.?); 9, *Q. lævis* (Catesbæi, Michx.?); 10, *Q. alba;* 11, *Q. lyrata*, which he first describes; 12, *Q. sinuata*, from the description of which it is not plain what it means; 13, *Q. villosa* already described by Wangenheim as *Q. stellata*. Michaux gives Catesby, who indeed described, but did not name it, the authorship of *Quercus aquatica*. De Candolle makes Walter the author of it; the latter published his Flora one year after the publication of Wangenheim's work, in which the species is described and called *uliginosa*. The descriptions of both the authors are as poor as possible; both the names derived from the hygrophile nature of the tree are good enough, only that the right of priority, acknowledged as a general rule by the international Botanical Congress at Paris, is in favor of Wangenheim's name. But the name *aquatica* is indeed older, and was first used by Clayton in *Gronovius*, so his name should be added. By the way, Walter is noteworthy for his modesty, which should be imitated by many an eager species-maker. His work is full of "Anonymos," and in the preface he says: "*Libertatem appellativæ assignandi paucis tantum concedendam sentit, quamobrem iis, qui in hac scientia merito duces sunt, jus reliquit dicendi quænam sint nomina plantis nunc primum descriptis.*" If so many botanists, who, overrating the doubtful merit of having created a new species, fill our botanical books with names, would follow modest old Walter, a good deal of wasted paper could be saved, and a good deal of unnecessary work. Indeed, it is much easier to make new species, than to clean those Augean stables of synonyms.

Aiton in "Kew Garden," 1789, calls the long-known *Q. sempervirens* of Catesby *Q. virens;* the latter name is adopted.

William Bartram, in his "Travels through North and South Carolina," Phil. 1791, proposes the new species *Q. tinctoria*, which De Candolle in

his Prodromus reunites with *Q. coccinea* Wg., as var. *γ tinctoria*. Bartram's *Q. hemispherica* and *dentata* are both varieties of *Q. aquatica*.

Luis Née joined the expedition of Malaspina from 1789 to 1794; he visited South America, Mexico and the Pacific Islands, and brought in his rich botanical collections to Europe, the first specimens of oak from those countries, which have been published in "Annales de Ciencias Naturales" by Cavanilles, 1798. Amongst these oaks are two California species, *Q. lobata* and *agrifolia;* the latter was already known to Plucknet as *Ilex foliis agrifolii Americana* (in "Phytographia," London, 1691–93, with a drawing, but without flower or fruit); the others are Mexican, *Q. circinata, magnoliæfolia, salicifolia, microphylla, splendens, acutifolia, elliptica, castanea,* and *candicans,* all considered yet to be "good species." His *Q. lutea* and *macrophylla* come under *magnoliæfolia;* his *diversifolia* is a variety of *Q. peduncularis* Née, changed by Willdenow into *Q. tomentosa,* because the character Née took the name from is variable, and Neè's specimen is defective; *Q. rugosa* Humboldt and Bonpland changed into *Q. crassifolia,* Née's unique specimen being very defective and doubtful.

André Michaux explored from 1785 to 1796 the forests of Eastern North America. He published in 1801 his "Histoire des Chênes l'Amérique Septentrionale," in which for the first time is pointed out a character, very important to the methodical arrangement of the oaks, the time of maturation. His arrangement is the following:

I. The leaves of the old tree not bristle-pointed: fruit peduncled, annual.
   1. Leaves lobed. *Q. obtusiloba* (*stellata* Wg.), *macrocarpa* (n. sp.) *lyrata* Walt., *alba* L.
   2. Leaves toothed. *Q. Prinus,* with 5 varieties: *palustris, monticola, acuminata, pumila* and *tomentosa.*
   3. Leaves entire. *Q. virens,* but the fruits are according to him biennial.

II. Leaves of the old tree bristle-pointed: fruit sessile, biennial.
   1. Leaves entire. *Q. Phellos,* with three varieties, *silvatica, maritima,* and *pumila. Q. cinerea, Q. imbricaria* (n. sp.), *Q. laurifolia,* with the variety *obtusifolia.*
   2. Leaves with short lobes. *Q. aquatica, Q. nigra, Q. tinctoria,* with two varieties (*angulosa* and *sinuosa*), *Q. triloba.*
   3. Leaves deeply lobed. *Q. Banisteri* (*ilicifolia* Wg.), *Q. falcata* (*hispanica* Clayton, *discolor* Ait., *elongata* Willd.), *Q. Catesbæi, Q. coccinea* Wg., *Q. palustris* Du Roi and *Q. rubra* L.

The same species are enumerated in his "Flora Americana," published by L. C. Richard, but without this arrangement. The ripening of fruit is not there mentioned at all.

Willdenow in "Species Plantarum," 1797–1810, enriched (?), the genus Quercus by new species, making out of the five varieties of Prinus, five species: *Prinus, montana, bicolor* (*tomentosa*), *castanea* (*acuminata*) and *Prinoides* (*pumila*); the varieties of *Phellos, maritima* and *pumila* he

changed into two species of the same name; *tinctoria* var., *sinuosa* into *discolor*, and his *Q. myrtifolia* is probably a variety of *Q. aquatica*.

Persoon in "Synopsis Plantarum," 1805 enumerates eighty-five oaks, of which forty-six are American; thirty from the eastern part of North America, two Californian and fourteen Mexican; all mentioned above.

F. A. Michaux, the son, published his "Arbres forestières," 1810–13. He calls *Q. Prinus tomentosa* of his father *Q. Prinus discolor*, and proposed five new species: *Q. heterophylla*, which proves to be an hybrid; *ambigua* and *borealis*, which fall under *Q. coccinea; ferruginea*, which is *Q. nigra* L. β.; and *olivæformis*, which is *macrocarpa*.

Humboldt and Bonpland collected (1799–1804) twenty-three new species, of which thirteen are now considered as good ones: *Q. confertifolia, crassifolia, crassipes, depressa, Humboldtii, lanceolata, laurina, obtusata, pulchella, repanda, reticulata, Tolimensis, Xalepensis;* four are dubious: *Q. Amalguerensis, chrysophylla, glaucescens* and *sideroxyla;* three had been described already by Née: *Q. stipularis = splendens* Née; *tridens = castanea* Née var. γ, and *Mexicana = Castanea* Née var. ξ; three are the same as other species of the same authors: *Q. spicata* is *reticulata* H. B.; *pandurata* and *ambigua* are *obtusata* H. B., var. β and γ. They are all Mexican, except three from New Granada: *Humboldtii, Tolimensis* and *Almaguerensis*. They are described in "Plantæ Æquinoctiales," 1805–1818.

In Pursh's "Flora," 1814, are mentioned thirty-four species; except *agrifolia*, all are eastern and comprising all the species of Michaux, with the additions of the younger Michaux and Willdenow. In his arrangement the ripening o the fruit takes the first place as a diagnostic character, the second the presence or absence o the bristles of the leaves; the third the form of the leaves.

Nuttall in "Genera of North American Plants," 1818, follows the same disposition, but the number of his species is thirty-two. He calls *Q. Prinus discolor* Mich. fil. *Q. Michauxii*, but at the same time he keeps *Q. bicolor* Willd. as a species with the variety *mollis* (probably *Q. velutina* Lam., which he believes is *Q. filiformis* Muhl.). Afterwards he proposes three more species: *Q. Gambelli, Leana* (a hybrid) and *dumosa* (in "Silva Americana,") a doubtful species. Of Mexican species he knew only fifteen.

Elliott in a "Sketch of the Flora of Georgia," 1824, enumerating twenty-six oaks, adds to those already known, a variety of *falcata* Michx. (var. *pagodæfolia*).

Chamisso and Schlechtendal, 1830, in "Linnæa," v., described some new Mexican oaks from specimens collected by Schiede and Deppe: *Q. calophylla, polymorpha, laurifolia, germana* and *oleoides*, the latter being *Q. virens* Ait. These make the western species amount to thirty-six.

Hooker and Arnott published in 1841, the "Botany of Capt. Beechey's Voyage," comprising the plants which Lay and Collie, 1825–28, collected. We find amongst them three oaks, two Californian: *Douglasii* and *densiflora*, and one Mexican: *aristata*. In "Hooker's Flora boreali Americana,"

1833-40, is described as new *Q. Garryana* by Menzies and Douglas, found in Oregon; and in "Icones," 1837-45; *Quercus corrugata* from Guatemala.

Bentham describes in the Botany of the voyage of the Sulphur, under command of Capt. Belcher, the collections of Barclay, Hinds and Sinclair. He proposes a new species of oak, *Quercus Hindsii*, from California which is nothing else than *Q. lobata* Née.

From the same author are the "Plantæ Hartwegianæ," 1839-42, containing the plants which Hartweg, 1836-40, collected in Mexico, etc. There we find a number of new species: *Q. barbinervis, glabrescens, Grahami, Skinneri, Sonomensis, dysophylla, undulata, salicifolia*, the two latter names, as already used, De Candolle changed into *Benthami* and *Tlapuxahuensis*. Others had already been described: *Q. Mexicana* is *crassipes* H. B., *Alamo* = *callophylla*, Cham. and Schl., *Hartwegi* = *obtusata* H. B., *petiolaris* = *polymorpha* Cham. and Schl., *callosa* = *tomentosa* Willd. Others are varieties; *tomentosa* = *tomentosa* Willd., var., *compressa* = *acutifolia* var., *laurifolia* = *densiflora* Hook, Arn. var. β. Hartwegi; *Douglasii* = *Douglasi.* Hook. Arn. var.; one proposed as a variety was afterwards taken as a species by Liebmann: *Q. obtusata* var. = *Q. laeta* Liebm. At the same time two Belgian botanists, Galeotti and Ghiesbreght, travelled in Mexico, and collected many oaks, which have been published, 1843, in "Bulletin of the Académie des Sciences of Bruxelles," by Galeotti and Martens: *Q. lanigera, lutescens, Ghiesbreghtii, nitens, insignis, rugulosa, glaucoides, callosa* (the latter described by Liebmann as *Q. laxa*); *Q. Galeottii, cordata, pubinervis* (not in Prodromus, perhaps *strompocarpa* Liebm.), *mollis* (perhaps *crassifolia*), are doubtful. Such as were already described are *Q. varians* = *polymorpha* Ch. and Schl., *nitida* = *acutifolia* Née, *acuminata* and *intermedia* = *calophylla* Ch. Schl., *spinulosa* = *crassifolia* H. B., *affinis* = *obtusata* H. B., *decipiens* = *reticulata* H, B., *laurina* = *depressa* Bth., *lanceolata* (not H. B.) = *Oaxacana* Liebm.

Liebmann travelled in Mexico in 1841-43. His own collection and those of Oerstedt and of Seemann furnished the material for his great work on "American Oaks." The new species are *Q. granulata, linguæfolia, nectandræfolia, berberidifolia, citrifolia, Costaricensis, Seemanni, Sartorii, Cortesii, læta, Drummondii, strompocarpa, grandis, Warscewiczii, chrysolepis.* Species already described are *Q. Fendleri*=*undulata* Torr. (in Annals Lyceum of New York, 1827), *furfurarea*=*acutifolia* H B., *commutata*=*nitens* M. G., *tristis*=*castanea* Née, *tuberculata*=*polymorpha* Cham. & Schl., *retusa* =*virens* Ait.; varieties of described species are *Q. resinosa*=*magnoliæfolia* Née, γ *rudinervis*=*obtusata* H. B. γ, *Neœi*=*Douglasii* var. γ, *longifolia*= *acutifolia* var. *ocotæfolia*=*nitens* var. γ, *perseæfolia* and *microcarpa*=*elliptica* Née var. His *Q. oocarpa* is the same as his *Warczewiczii*; what he took for *laurina* is *lanceolata* H. B., var. β.; *Q. Grahami* Bth., is *acutifolia* Née, his *lancifolia* is a new species by A. DeCandolle changed into *leiophylla*; *Q. bumelioides, cuneifolia* (*Chinantlensis*), *excelsa, eugeniaefolia, flavida, floccosa, fulva, jurgensenii, Oaxacana, Orizabae, sapotaefolia, Segoviensis, serra, sororia, scytophylla, turbinata* (by A. DC., changed into *Guatimalen-*

sis), are doubtful species. From Wright's collection he described Q. *pungens*, *hastata* and *grisea*, already published by Torrey, the two former as *Q. Emoryi* (in Emory's Report) the latter as *Q. oblongifolia* in Sitgreaves' Zuni Expedition. Other species of Torrey had been already named, when he published them: *Q. crassipocula* (in Williamson's Report) is *chrysolepis* Liebm., described in "Plantæ Hartwegianæ;" *Q. tinctoria* var. *Californica* (in Whipple's Report) is *Sonomensis* Bth.; *longiglanda* in "Frem. Geogr. Mem. of Cal.," is *lobata* Née; *echinacea* (in Whipple's Rep.) is *densiflora*, *oxyadenia* (in Sitgreaves' Report) is *agrifolia* Née. In "Mexican Boundary Survey" (1858), is a new species described as *Q. acutidens* from California, omitted by De Candolle; another, *obtusifolia*, falls under *undulata* Torr., as a variety; another variety is there mentioned, *Q. coccinea* var. *microcarpa*. Kellogg published in the "Proceedings of the California Academy of Sciences," vol. i, some new species, which are not new: *Q. fulvescens* is *chrysolepis* Lbm.; *acutiglandis* is *agrifolia* Née; *Ransomi* is *lobata* Née. His *Q. Morchus* (Proc. Cal. Acad. Sci. ii) is doubtful. Newberry proposed what Torrey took for a variety of *tinctoria* (*i. e. coccinea*), as a new species, *Q. Kelloggii*, which falls under *Sonomensis* Benth. Curtis, 1849, proposed a new eastern species, *Q. Georgiana*. Shuttleworth's *Q. Floridana* is the var. *β. Floridana* of *Q. stellata* according to De Candolle, perhaps Chapman's var. *parvifolia?* Endlicher in "Genera Plantarum," Suppl. iv, 2, 1847, enumerates one hundred and ninety-seven described oaks, of which one hundred and one are American. — FRED. BRENDEL, *Peoria, Ill.* (*To be concluded.*)

ZOOLOGY.

SPIKE HORNS. — The article in the December number of the NATURALIST seems to me to be the result of careless observation. The 'Common Deer," *Cervus Virginianus*, 'begins growing his first pair of horns when about one year old; these horns are from four to nine inches long and sometimes one of them will have a single branch of an inch or two long; these horns are shed when the animal is about two years old (Fig. 67). At this age I have seen deer that had attained their full growth in height, and to an ordinary observer would be thought old animals.

Fig. 67.

The number of persons hunting in the Adirondacks increases very rapidly, and every hunter is bent on procuring a fine pair of horns as a trophy, and as it takes at least six or eight years for a buck to grow a fine

pair of antlers, you can see that the chances for a deer to attain a full development is growing more unfavorable every year. The reason why *spike horns seem to be* more numerous than formerly, is that there are more hunters and fewer old deer. If any one can show me a spike horn of a deer that is three or more years old, that is not the result of accident, I would like to get it.

The same difficulty exists with the moose and carraboo. It is now almost impossible to procure a large and well developed pair of moose or carraboo horns, while some years ago they were plenty. — W. J. Hays.

Adirondack's Reply. — In replying to the criticism of Mr. Hays, I can, unless I can take time to collect testimony, only reiterate my former statements, that I shot on Louis Lake a buck with spike-horns, which was not a yearling, nor a two years old, nor a three years old even, but a *large* buck, of full age and size; and that I afterwards shot on Cedar Lakes a buck with spike-horns, which was pronounced to be a "three year old." I will add that I have conversed on the subject of "spike-horn bucks" with a number of hunters and guides, some born in the Adirondacks, others who have lived there many years, and that the testimony of all agreed that spike-horn bucks are of all ages and sizes, and that they are slowly increasing in the southern part of the Adirondack region.

When I shot the large buck on Louis Lake, Silas Call, then a noted and most intelligent guide, now keeper of the inn at Northville, was with me. He will undoubtedly remember the facts and testify to them if called upon. When I shot the smaller spike-horn, William S. Robinson, Esq., of Malden, Mass., stood by my side. Hon. F. W. Bird, of Walpole, was of the party, and saw the deer at the shanty. I do not know that either of these gentlemen has ever given attention to the subject of spike-horn bucks; but Mr. Bird has hunted a good many years in the southern Adirondacks, and I think must know something about them. [I beg pardon of these gentlemen for using their names without their consent, but, living at a place reached only by infrequent mails, I have no time to procure it.] David Sturges, the keeper of the inn at Lake Pleasant, born there, and one of the best and most successful guides and hunters of the Adirondacks, could give valuable testimony on the question. He has been upon the lookout all through the past autumn and early winter, for the head of a large spike-horn buck for you, but has not succeeded in procuring one. Bucks have now lost their horns, and a head cannot be procured unless with horns "in the velvet," before next September. I hope then Mr. Sturgis will be more successful. But spike-horn bucks, of full age and size, are not yet common, and a young one will not answer your purpose.

Of the figures of "spike-horns" (Fig. 67) by Mr. Hays, neither resembles very closely the true spike-horn. I have the pair from the young spike-horn buck shot by me, and will send them to you whenever I go to a place reached by the express. I will send with them the antlers of a common "two year old" buck. You will at once see the difference. You will see too, what was the fact, that the spike-horns came from the larger deer.

The distance between the horns shows this. The spike-horns are about half an inch farther apart than the others, showing the spike-horn buck to have been probably a year older than the other. The hair on the skull of the spike-horn buck is shorter than that on the other; the spike-horn was shot just as deer were attaining the "blue coat;" the other was shot a month or six weeks later. This is the reason of the difference.

Notwithstanding what Mr. Hays says, I never saw a yearling buck (that is a buck in his second year, wearing his first pair of horns) that could be said to have "attained full growth," in "height," or anything else. I never saw a "two years old" (in his third year) that had attained full growth in all respects — nor yet "a three years old." The saddle of a two years old will never exceed forty or fifty pounds in weight. I doubt whether the saddle of a yearling ever reaches the smaller weight, while I have seen full grown antlered bucks, whose saddles weighed over seventy pounds; and I have the head of one whose saddle weighed a little over eighty pounds. I have heard of bucks still heavier. Without the antlers, there may in some cases be difficulty in distinguishing between a two years old and a three years old; but there is *never* any difficulty in distinguishing between either of these and a buck of six or seven years. A yearling (in his second year) can always be known by his size. A buck in the spring, when he attains the full age of two years, never has horns, and has had none for some time. *While his first pair of horns lasts* surely he can never be said to have "attained full growth" in any respect. Shot in the fall previous, his youth is very manifest. Yet it is the first pair of horns only that are ever "spikes" in a common *C. Virginianus*.

Did Mr. Hayes ever hunt south of Raquette Lake, or ever south of Long Lake? I think it probable that he enters the Adirondacks over the more common route by way of Keesville and the Saranac Lakes, and hunts in the Raquette River country, north of Long Lake. I have hunted through the whole region from the Saranac Lakes south to Saratoga and Fulton counties, and west into Herkimer county and the "Brown tract." But I have visited the country north of Long Lake only once.

The writer in the "Saginaw Republican" apparently knows little of deer. A yearling buck (in his second year, with his first pair of horns) has spike-shaped horns; but at the rutting season he is scarcely eighteen months old, and is quite too young and small to be a rival of a full-grown buck, while a two years old buck (in his third year with his second pair of horns) has antlers which are scarcely more formidable weapons than the antlers of a full-grown buck. In point of fact I believe the full-grown bucks have altogether the advantage with the does.—ADIRONDACK.

GEOLOGY.

NEW ANIMAL REMAINS FROM THE CARBONIFEROUS AND DEVONIAN ROCKS OF CANADA. — Principal Dawson has discovered another species of amphibian from the Joggins Coal Mine, the *Baphetes minor;* the remains consisting of a lower jaw six inches long. The author also noticed some

insect remains found by him in slabs containing Sphenophyllum. They were referred by Mr. Scudder to the Blattariæ. From the Devonian beds of Gaspè the author stated that he had obtained a small species of Cephalaspis, the first yet detected in America. Mr. Etheridge remarked that the Cephalaspis differed materially in its proportions from any in either the Russian or British rocks. — *Nature.*

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Maryland Academy of Sciences. — By this title we announce the organization of a Natural History Society in the city of Baltimore. We are glad that the long continued efforts of the gentlemen who are its present officers have at length resulted in the establishment of a society regularly chartered, and with some fifty members. They have, as it appears from an official communication to the Director of the Peabody Academy, already secured proper apartments, centrally located, and received donations of collections of books and specimens, and begun the regular scientific work of the society. The circular which the academy has published certainly states their case very fairly and modestly to the citizens of Baltimore, and we do not see how they can do otherwise than sustain the new society if they care at all for the completion of their system of public instruction.

Such societies devoted to the exposition of the natural resources of the country have a recognized value in Europe and in some of the cities of this country. But their refining influence upon society, the cultivation which results from their publications and teachings, especially if they become sufficiently well endowed to institute lectures to teachers and advanced students of the public schools, as the Boston Society has done, is not at all appreciated or even understood.

The basis of the new academy, as announced in article two, is broad and effective, and ought to insure its members the moral and material support of the community which is to be benefited by the labor of its members. As stated in this article "its object shall be to promote scientific research, and to collect, preserve and diffuse information relating to the sciences, *especially those connected with the natural history of Maryland.*"

The officers of the academy are Philip T. Tyson, president; John G. Morris, D.D., vice-president; Edwin A. Dalrymple, D.D., corresponding secretary; Charles C. Bombaugh, M.D., recording secretary; John W. Lee, treasurer; P. R. Uhler, curator; A. Snowden Piggott, M.D., Librarian; J. B. Uhler, J. DeRosset, M.D., and F. E. Chatard, jr., M.D., assistant curators.

BOOKS RECEIVED.

Description d' un Jeune Individu de la Dermatemys Mawii espece Americaine de la famille des Elodites. Par. M. Alf. Preudhomme de Borre. Brussells, 1869. 8vo. pp. 7.

Description d' une nouvelle espece Americaine du genre Caiman Alligator. Par. M. Alf. Preudhomme de Borre. Brussells, 1869, 8vo. pp. 8.

Bulletin de la Societe des Sciences Naturelles. Neuchatel, Switzerland. Tom. iv - viii, 1855-69. 8vo.

Annales Academici, 1816-65. Leiden. 42 vols. 4to. [1867. 8vo.

Torslag til en Forandret Ordning af det hoiere Skolevaesen. Del. 1-3. 8vo. Christiania.

Det K. Norske Fred. Univ. Aarsberetning for Aaret, 1866. 8vo. Christiania, 1869. 8vo.

Index Scholarum 4to. Christiania, 1869. 4to.

Le Glacier de Boium en Juillet, 1868. Par S. A. Sexe. Christiania, 1869. 4to. pp. 40.

En Anatomisk Beskrivelse af de paa. Over og Underextremiteterne forekommede. Bursæ Mucosæ. A. S. D. Synnestvedt. Udgivet ved Dr. J. Voss. Christiania, 1869. 4to. pp. 88.

The Mammals of Iowa. By J. A. Allen. [From Proc. Bost. Soc. Nat. Hist., Vol. xiii, Dec. 1869.]

Notes on the Rarer Birds of Massachusetts. By J. A. Allen. [From Am. Nat., Vol. iii.]

Contributions to the Natural History of Nova Scotia, Part I, *Coleoptera.* By J. Matthew Jones. [From the Trans. N. S. Inst. Nat. Sci., 1870.]

Abstract of Some Remarks on the Relations of the Rocks in the vicinity of Boston. By N. S. Shaler. [From Proc. Bost. Soc. Nat. Hist., xiii, Dec., 1869.]

Proceedings and Transactions of the Nova Scotian Institute of Natural Science. Vol. ii, Pt. 3. 1868-9. 8vo. Halifax, 1870.

The West Coast Fresh-water Univalves, No. 1. By J. G. Cooper. [From Proc. Cal. Acad. Sci., iv, Feb., 1870.]

The Fauna of California and its Geographical Distribution. By J. G. Cooper. [From Proc. Cal. Acad. Sci., iv, Feb. 1870.]

Contributions to Zoology from Museum of Yale College, No. 6. Descriptions of Shells from Gulf of California. By A. E. Verrill. [From Am. Jour. Sci. and Arts, Mch., 1870.]

Transactions of the American Entomological Society. Vol. ii, No. 4.

Proceedings of the Academy of Natural Sciences of Philadelphia, No. 3. Aug.-Nov., 1869.

The Arts. Vol. i, No. 1, March, 1870. Chicago. J. M. Hersh & Co. $1.00 a year.

The Game Birds of America. By D. Darwin Hughes. (Contained in several numbers of the "Detroit Free Press" for Feb. and following.)

Address of the President of the Peabody Institute to the Board of Trustees on the Organization and Government of the Institute. Feb. 12, 1870. Baltimore.

Third Biennial Report of Trustees of Iowa Agricultural College. Des Moines, 1870.

Seventh Annual Report of Trustees of Massachusetts Agricultural College. Boston, 1870.

Annual Report of Superintendent of Education of Ontario for 1868. Toronto, 1869.

Annual Report of Adjutant General of Maryland for 1869.

Fourth Report of the Massachusetts Commissioners of Fisheries for the year 1869. Boston, 1870.

Catalogue of Officers and Students of University of Michigan. Ann Arbor, 1870.

Circular and Catalogue of Union College. Albany. 1870.

Meteorological Observations for 1869 *at Iowa City.* By T. S. Parvin.

Prairie Farmer Annual (No. 3. 30 cts.) Chicago.

Monthly Report of Department of Agriculture for Jan., 1870.

Bulletin of the Torrey Botanical Club. New York. Nos. 1, 2, 3, Jan., Feb., March, 1870. 8vo, 4 pages each. ($1.00 a year. W. H. Leggett, 224 E. 10th St., N. Y.)

Bowdoin Scientific Review. Nos. 1, 2, 3, Feb., March, April, 1870. 8vo, pp. 16. (Fortnightly, $2.00 a year. Professors Brackett and Goodale, Brunswick, Me.)

The Academy. Nos. 5, 6, 7, Feb., March, April. London.

Scientific Opinion. Nos. 66-72, Feb., March. London.

Nature. Nos. 1-9, Nov., Dec., 1869; Feb. 10, 17; Mch. 3, 10, 17, 1870. London. MeMillan & Co.

The Field. June, 1869, to March 5, 12, 19, 24, April 2, 1870. London.

Land and Water. Jan. 15, 22, 29, Feb. 5, 12, 19, 26. London.

Petites Novelles Entomologiques. Nos. 16, 17. Feb., March Paris.

Le Naturaliste Canadien. ii, Nos. 3, 4. Feb., March. Quebec.

Bulletin de la Societe Imperiale d'Acclimation. vi, No. 12. Dec., 1869. vii. No. 1, Jan., 1870. Paris.

Notes on the Later Extinct Floras of North America with descriptions of New Species of Cretaceous and Tertiary Plants. By J. S. Newberry. (From Ann. Lyc. N. Y. ix, 1868.)

Verhandlungen der k. k. geologischen Reichsanstalt. Vols. for 1867 and 1868, and Nos. 1-13 of 1869. Wien. Large 8vo.

Jahrbuch der k. k. geologischen Reichsanstalt. Vols. for 1867 and 1868, and Nos. 1, 2, 3, of 1869. Wien. Large 8vo.

Jahresbericht der Naturforschenden Gesellschaft in Emden. 1868. 12mo.

Science Gossip. March, April. London.

How Crops Feed: a Treatise on the Atmosphere and the Soil as related to the Nutrition of Agricultural Plants. With illustrations. By S. W. Johnson (Professor in Sheffield Scientific School). New York. Orange Judd & Co. 12mo, pp. 375. 1870.

Naturalist's Note Book. March, 1870. New Series. London. Bemrose and Sons.

On the Graphite of the Laurentian of Canada. By J. W. Dawson. [From the Proceedings of the Geological Society. London, 1869.]

Canadian Naturalist and Geologist. Vol. iv, No. 4. Dec., 1869. Montreal.

The Canadian Entomologist. Vol. ii, Nos. 5, 6. March, April. Toronto.

Annals of the Lyceum of Natural History of New York. Vol. 9, No. 9. March, 1870.

Second List of birds collected at Conchitas, Argentine Republic. By Wm. Hudson. *With Notes upon another Collection from the same Locality.* By P. L. Sclater and Osbert Salvin. [From Proceedings Zoological Society. London. March, 1869.]

The Annals of Iowa. By the State Historical Soc. Jan., 1870. 8vo. (quarterly). Iowa City.

Notice of Fossil Birds from the Cretaceous and Tertiary Formations of the United States. By O. C. Marsh. [From the American Journal of Science and Arts. March, 1870.]

Notes on Harper's Willson's Readers. By S. S. Haldemann. 1870. 12mo, pamph.

American Entomologist. March, 1870.